PROCEEDINGS

OF THE

AMERICAN SOCIETY

OF

CIVIL ENGINEERS.

(INSTITUTED 1852.)

VOL. VII.

JANUARY TO DECEMBER, 1881.

NEW YORK:

PUBLISHED BY THE SOCIETY:

1881.

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NOTE.—This Society is not responsible, as a body, for the facts and opinions advanced in any of its publications.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. VII.—January, 1881.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JANUARY 5TH, 1881.—The Society met at 8 P. M., William P. Shinn in the chair. Ballots were canvassed, and the following candidates declared elected: As Members—William Robert Eckart, San Francisco, Cal.; John Simpson Walker, Wheeler, Ala.; Francis Milton Wilder, Binghamton, N. Y. As Juniors—Arthur Vaughan Abbott, Brooklyn, N. Y.; John William Ferguson, Rutherford, New Jersey.

A paper, subject "The Strongest of the Bronzes; A Newly Discovered Alloy of Maximum Strength." by R. H. Thurston, Member A. S. C. E., was read by the author, illustrated by models and by samples of bronzes, and discussed by Messrs. Forney, Holley, Shinn, Thurston and Worthen.

The death, on December 17, 1880, of Henry R. Worthington, Member A. S. C. E., was announced, and a committee appointed to prepare a memoir for publication in the Proceedings.

ANNOUNCEMENTS.

AT THE MEETING OF THE SOCIETY to be held Wednesday, February 16, 1881, at 8 P. M., the discussion will take place of the paper on "Wind Pressure upon Bridges," by C. Shaler Smith, Member A. S. C. E. Advance proofs of this paper have been prepared and furnished to members who might desire to participate in the discussion.

The following resolutions were adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad, and whereas it is desirable that the relation of the units of the differing systems be made familiar to all by comparison:

Resolved, That members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.

The House of the Society is at 104 East Twentieth street, one door east from Fourth avenue, and near the southwest corner of Gramercy Park. It is open from nine o'clock A.M. to five o'clock P.M. each business day, except Saturday, when it is closed at three o'clock P.M.

The Library and Conversation Rooms will also, for the present, be open every *Wednesday evening* from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Wednesday evenings both for consultation of books and periodicals and for conversation.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

		Date of Election.
ECKART, WILLIAM R.	P. O. Box 1587, San Francisco, Cal.	January 5, 1881.
WALKER, JOHN S.	Huntsville, Ala.	" "

JUNIORS.

ABBOTT, ARTHUR V.	21 Water St., Brooklyn, N. Y.	January 5, 1881.
FERGUSON, JOHN W.	Ass't. Engineer New York, Lake Erie & Western Railway, Rutherford, N. J.	" "

CHANGES AND CORRECTIONS.

MEMBERS.

BUCK, L. L.	124 Bedford Ave., Brooklyn, N. Y.
GUNNELL, WILLIAM C.	600 20th St., Washington, D. C.
JOHNSON, L. M.	Assistant to President Pullman's Palace Car Co., Chicago, Ill.
MASTEN, C. S.	Chief Engineer St. Louis, Jerseyville & Springfield, R. R., Rochester, N. Y.
NICHOLSON, GEORGE B.	Chief Ass't. Engineer Knoxville & Cincinnatti Southern Railway, Covington, Ky.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. VII.—February, 1881.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JANUARY 19TH, 1881.—The Society met at 8 p. m., Vice President Chanute in the Chair.

A discussion by Amory Coffin, Member A. S. C. E., on the paper by C. L. Gates, Junior A. S. C. E., was read by the Secretary.

The subject of Inter-Oceanic Transit was discussed by members present.

FEBRUARY 2D, 1881.—The Society met at 8 p. m., President James B. Francis in the Chair.

Ballots for membership were canvassed, and the following candidates declared elected as Members: Nathaniel Webster Ellis, of Manchester, New Hampshire, and Louis Randolph McLain, of Buchanan, Virginia.

The vote for determining the place for the Thirteenth Annual Convention was canvassed, with the following result:

Montreal received	76 votes.
Niagara Falls received	45 "
The Thousand Islands received	39 "
Other places received	5 "

The City of Montreal was thereupon determined as the place, and it was referred to the Board of Direction to determine the time, and to make arrangements for the Thirteenth Annual Convention of the Society. These will be announced at as early a date as possible.

Ballots for the proposed Amendments to the Constitution were canvassed, with the following results :

Upon the proposed Amendment to Article V (see Proceedings, Vol. VI, pages 84 and 93), there were—

In the Affirmative..... 157 votes.
In the Negative..... 4 "

This Amendment was thereupon declared adopted. The amended Article is as follows :

ARTICLE V.—The officers of the Society shall consist of a President, two Vice-Presidents, a Secretary, Treasurer, Librarian, and five Directors, who shall be elected by written ballot, by a majority of votes, at the Annual Meeting of the Society. The term of office shall begin at the close of the Annual Meeting, and continue for one year, or until other officers are elected. Any vacancy occasioned, by resignation or otherwise, may be filled at the next monthly meeting after notice of said vacancy.

Upon the proposed Amendment to Article XXII (see Proceedings, Vol. VI, pages 84 and 93), there were—

In the Affirmative..... 156 votes.
In the Negative..... 5 "

This Amendment was thereupon declared adopted. The amended Article is as follows :

ARTICLE XXII.—The amount of entrance fee to be paid, as well as the annual dues or assessments for the support of the Society, shall be determined from time to time, at some regular meeting of the Society, provided that notice of intended action thereon shall have been given at a previous regular meeting. No alteration in the amount of said fees or assessments shall apply to the fiscal year during which it is made, but shall take effect on and after the first day in January next succeeding the day of the date of said alteration. Members who become Residents or Non-Residents by removal into or beyond the limits prescribed in Article XXI, shall be subject to assessments in the class in which they were on the day of the Annual Meeting, as may appear upon the records of the Society or by written notice to the Secretary.

Upon the proposed Amendment to Article XXIII (see Proceedings, Vol. VI, pages 84 and 93), there were—

In the Affirmative..... 139 votes.
In the Negative..... 18 "

This Amendment was thereupon declared adopted. The amended Article is as follows :

ARTICLE XXIII.—Honorary Members, not exceeding twenty in number, in all, may be appointed by a unanimous vote of the Board of Direction and such Past Presidents of the Society as shall be at the time Members of the Society and resident in the United States. A person to be eligible as an Honorary Member shall be a gentleman of acknowledged eminence in some branch of engineering. Honorary Members shall be subject to no fees or assessments, and shall not be entitled to vote.

Upon the proposed Amendment to Article XXX (see Proceedings, Vol. VI., pages 84 and 93), there were—

In the Affirmative..... 156 votes.
In the Negative..... 5 "

This Amendment was thereupon declared adopted. The amended Article is as follows :

ARTICLE XXX.—The Annual Meeting for the election of officers and hearing the Annual Reports shall be held on the third Wednesday in January. The Board of Direction shall lay before the meeting a report of the state of the Society, together with a statement by the Treasurer, verified by the Committee on Finance, of the funds of the Society, and the receipts and payments during the year ending on the 31st of December preceding.

Upon the proposed Amendment to Article XXXI (see Proceedings, Vol. VI, pages 84, 90 and 93), there were—

In the Affirmative..... 156 votes.
In the Negative..... 5 "

This Amendment was thereupon declared adopted. The amended Article is as follows :

ARTICLE XXXI.—The annual contributions shall become due for the ensuing year on the first day of January, and shall be payable in advance. It shall be the duty of the Secretary to notify each Member of the amount due for the ensuing year, at the time of giving notice of the Annual Meeting.

Upon the proposed Amendment to Article XIX (see Proceedings, Vol. VI, pages 94 and 97) there were—

For the Amendment as originally proposed and as printed, page 94, Proceedings, Vol. VI, 32 votes.

For the proposed Amendment as amended at the Annual Meeting and as printed, page 97, Proceedings, Vol. VI, 67 votes.

That neither Amendment be adopted, leaving the Article as at present, 59 votes.

These proposed Amendments not having received an affirmative vote of two-thirds of all ballots cast, were declared not adopted.

Ballots were canvassed upon the proposed Amendment to take the place of Section 24 of the By-Laws as printed, page 97, Proceedings, Vol. VI, with the following result—

In the Affirmative..... 32 votes.
In the Negative..... 113 "

This proposed Amendment, not having received two-thirds of all the votes cast, was declared not adopted.

The Board of Direction was requested to consider and report what action the Society should take in reference to the proposed International Exhibition in New York in 1883.

OF THE BOARD OF DIRECTION.

FEBRUARY 2D, 1881.—Applications were considered. Action was taken in reference to the proposed collection of a building fund.

ANNOUNCEMENTS.

A list of the additions to membership in the Society, together with the corrected addresses of all Members whose address is different from that given in the Catalogue of July, 1880. is issued with this number of the Proceedings. This list is corrected to date, and is arranged so that it makes, in connection with the Catalogue of July, 1880, a complete list of the Members of all classes, with their addresses.

All Articles of the Constitution which have been amended since the issue in January, 1879, of the printed copy of the Constitution and By-Laws have been issued to the Members of the Society upon a slip, which can be pasted in the printed copies, thus making those copies, with the addition of the slip, correct records of the present Laws of the Society.

The Thirteenth Annual Convention of the Society will, as determined by the letter ballot canvassed February 2, 1881, be held at Montreal, Canada. The Board of Direction has been requested to determine the time, and to make arrangements for the Convention. These will be announced as soon as possible.

LIST OF MEMBERS.

ADDITION.

MEMBER.

	Date of Election.
ELLIS, N. W.....52 Wall Street, New York City, N. Y.....	Feb 2, 1881.

CHANGES AND CORRECTIONS.

MEMBERS.

MOORE, CHARLES E.....Ass't. Engineer, St. Louis, Jerseyville and Springfield R. R., Jerseyville, Ill.

RICE, E. C.....Chief Engineer Louisville, New Albany and St. Louis Railway, 3649 Pine Street, St. Louis, Mo.

WEEKS, HARVEY R.....Div. Engineer Cincinnati Southern Railway, Butlerville, Ind.

JUNIOR.

CROSBY, B. L.....40 Cedar Street, Roxbury, Mass.

RESIGNATION.

WARREN, G. K.....Member.....Dec. 4, 1880.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. VII.—March, 1881.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

FEBRUARY 16TH, 1881.—The Society met at 8 P. M., Vice-President Chanute in the Chair. The paper upon Wind Strains in Bridges, by C. Shaler Smith, Member A. S. C. E., which was read December 15th, 1880, was discussed by Charles E. Emery and, by letter, by Messrs. Charles Douglas Fox, Robert E. Johnston, G. Bouscaren, Robert Fletcher, A. Gottlieb, W. S. Pope, Charles A. Smith, Don. J. Whittemore and Joseph M. Wilson.

MARCH 2D, 1881.—The Society met at 8 P. M., Vice-President Welch in the Chair. Ballots were canvassed, and the following candidates declared elected: As Members, William Archer, Cincinnati, O.; Henry Adamson Bentley, Newport, R. I.; Theodore Newel Ely, Altoona, Pa.; Benjamin Reece, Toledo, O.; Sebastian Wimmer, New York City, N. Y. As Juniors, William Miller Allaire, New York City, N. Y.; Ward Baldwin, Cincinnati, O.; Francis Newberry Holbrook, Brooklyn, N. Y.

The death of A. D. Briggs, Fellow of the Society, was announced, and a committee appointed to prepare a memoir for publication in the proceedings.

Specimens of stone cut from the Obelisk recently erected in the Central Park, New York, and of the stone of the steps, of the white mortar, of the yellow cement, a piece of one of the steel clamps, of the lead, and of the copper dowels connected with the copper crabs used in Egypt in connection with the Obelisk, were presented to the Society by Lt. Commander Gorringe. U. S. N., and the thanks of the Society tendered to him for these additions to its museum.

A paper by W. S. Auchincloss, Member A. S. C. E. Subject: "Exponent of the Principle of Moments," was read by the author, and an Averaging Machine described in the paper was practically exhibited.

The discussion on the subject of Wind Strains in Bridges, was continued by Messrs. O. Chanute, Joseph P. Davis and Ashbel Welch.

MARCH 15TH, 1881.—The Society met at 8 P. M. President James B. Francis in the Chair. A paper by Lt. Commander Gorringe, U. S. N., on "The removal of the Obelisk from its Site in Alexandria, Egypt, to its present Site in the Central Park, New York City," was read by the author and illustrated by special drawings.

ADDITIONS TO

LIBRARY AND MUSEUM.

From Administration des Ponts et Chaussées, Paris:

Annales. November and December, 1880.

From American Institute of Mining Engineers, Thomas M. Drown, Secretary, Easton, Pa.:

Transactions. Vol. VIII. May, 1879 to February, 1880.

List of Officers and Members, and Rules of the Institute, November, 1880.

The Wearing Power of Steel Rails in relation to their Chemical Composition and Physical Properties. Charles B. Dudley. Easton. 1881.

The American Bloomary process for making Iron direct from the Ore. Thomas Egleston.

The Chemical Reactions in the Bessemer process; the charge containing but a small percentage of Manganese. Charles F. King.

The cost of Milling Silver Ores in Utah and Nevada. R. P. Rothwell.

On Rail Specifications and Rail Inspection in Europe. C. P. Sandberg.

From Argentine Scientific Society, Don Eduardo E. Clerice, Secretary, Buenos Ayres:

Anales. December, 1880.

From Boston Society of Civil Engineers, S. E. Tinkham, Secretary, Boston:

Proceedings. December, 1880.

Additional Width of Gauge on Railroad Curves. Thomas Doane.

From Henry T. Bovey, Montreal, Canada:

Cribwork in Canada. Henry T. Bovey. London, 1880.

From Burnham. Parry & Williams & Co., Philadelphia:

Illustrated Catalogue, of Baldwin Locomotive Works. Philadelphia, 1881.

From Bureau of Steam Engineering, Washington, D. C.:

Report of the Board to recommend a Standard Gauge for Bolts, Nuts and Screw-threads for the U. S. Navy. May, 1880.

From Hon. Allan Campbell, Comptroller, New York:

Report of the Department of Public Works, Quarter ending September 30, 1880.

From H. Wadsworth Clarke, Syracuse, N. Y.

Proceedings of the Board of Supervisors of the County of Onondaga, N. Y. for 1880.

From Justin Dirks, Amsterdam, Holland:

De Rotterdamsche Waterweg. Justin Dirks, Amsterdam, 1881.

From Engineer Department, U. S. A. Gen. H. G. Wright, Chief of Engineers, Washington, D. C.:

Advertisement for Removing Obstructions from Red River, La.

Specifications for building an Iron Sternwheel Snag Boat. Maj. W. H. H. Benyaurd.

Annual Report of the Engineer in charge of the Completion of the Washington Monument. Col. Thos. Lincoln Casey.

The Harbor at Baltimore. Col. W. P. Craighill.

Specifications for Improvement of Mobile Harbor, Ala. Capt. A. N. Damrell.

The Improvement of Winton Point, Ill. Capt. O. H. Ernst.
Specifications for Improving the Lower Willamette and Columbia Rivers. Maj. G. L. Gillespie.
Specifications for Improving the Upper Columbia and Snake Rivers. Maj. G. L. Gillespie.
Specifications for Improving lower Clearwater River near Lewiston, Idaho, Maj. G. L. Gillespie.
Specifications for Improving Volusia Bar, Florida. Gen. Q A. Gillmore.
Specifications for Imyrovement of Savannah Harbor and River, Georgia. Gen. Q. A. Gillmore.
Specifications for Improvement of Harbor at Brunswick, Ga. Gen. Q. A. Gillmore.
Specifications for Improving Harbor at Waukegan, Ill. Maj. D. C. Houston.
The damages caused by the Improvement of Fox and Wisconsin Rivers. Maj. D. C. Houston.
Report of Survey of the Calcasieu River, La. Capt. C. W. Howell.
Specifications for continuing Improvement of Pearl River, Miss., from Jackson to Carthage. Capt. C. W. Howell.
Specifications for Improving Bayou Teche, La. Capt. C. W. Howell.
Specifications for Improving Amite River, La. Capt. C. W. Howell.
Specifications for Improving Pearl River, below Jackson, Miss. Capt. C. W. Howell.
Specifications for Improvement of Schuylkill, River, Pa. Col. J. N. Macomb.
Specifications for Improvement of Susquehanna River above Richard Island, Pa. Col. J, N. Macomb.
Reports of Surveys on the Mississippi River at Andalusia, Ill , and Louisiana, Mo. Capt. A. Mackenzie.
Specifications for furnishing Material for the Improvement of Galveston Harbor. Maj. S. M. Mansfield.
Specifications for Improvement Petaluma Creek, Cal. Col Geo. H. Mendell.
Specifications for Improvement of Oakland Harbor, Cal. Col. Geo. H. Mendell.
A Report of the Survey of the Youghiogheny River. Col. Wm. E. Merrill.
Specifications for Ohio River Improvement. Col. Wm. E. Merrill.
Reports of Surveys of the Sumpawaums Inlet, Patchogue River, and waterway connecting Jamaica Bay with Cornell's Landing. Gen. John Newton.
Specifications for Improvement of Raritan River, New Jersey. Gen. John Newton.
Specifications for Improving Buttermilk Channel, New York Harbor. Gen. John Newton.
Report of Survey for a harbor at Kewaunee, Va. Maj. H. M. Robert.
Report on the Maintenance of the Des Moines Rapids Canal Capt. A. Stickney.
Specifications for Rubble Stone in Rockland Harbor, Me. Gen. Geo. Thom.
Specifications for Dredging Exeter Harbor, N. H. Gen. Geo. Thom.
Reports of Surveys of Wareham Harbor and Potowamut River. Gen. G. K. Warren.
Report of Work on Connecticut River. Gen. G. K. Warren.
Specifications for Excavating Material and Constructing Pier Revetment, at the St. Mary's Falls Canal, Mich. Maj. G. Weitzel.
Specifications for Removing Shoals in and around the Harbor of Refuge at Sand Beach, Mich, Maj. G. Weitzel.
Specifications for Fairport Harbor, Ohio. Maj. John M. Wilson.
The Preliminary Report of the Mississippi River Commission.

From Engineers' Society of Western Pennsylvania, Jas. H. Harlow, Secretary, Pittsburgh :

Annual Reports. January, 1881.
Discussion on The Basic Dephosphorizing Process. What is it, and what may be expected from it.
Dam of the Montaubry Reservoir. Lieut. F. A. Mahan.

From Theo's. French, Auditor Railroad Accounts, Washington:

Annual Reports for 1878, 1879, and 1880.

From Fred. de Funiak, Gen. Man. Louisville and Nashville R. R. Louisville:

Annual Report year ending June 30, 1880.

From Charles O. Gleim, Cologne, Germany:

Das techniche Vereinswesen des Auslandes und die daraus zu ziehende Nutzanwendung für die. Deutschen Verhältnisse. Gustav Meyerand C. O. Gleim. Berlin. 1880.

From Robert B. Gorsuch. Mexico:

The Mexican Southern Railway, to be constructed under a Charter from the Mexican Government, through the States of Vera Cruz and Oaxaca. Robert B. Gorsuch. New York, 1881. (*Copies for distribution.*)
The Republic of Mexico and Railroads. A brief review of her past history and present condition. Robert B. Gorsuch. New York, 1881. (*Copies for distribution.*)

From E. J. Habich, Lima, Peru:

Anales de Constructiones Civiles y de Minas del Peru. Tomo 1. Lima, 1880
Etudes Cinématiques. M. E. J. Habich. Paris, 1879.

From Institution of Civil Engineers, James Forrest, Secretary, London:

Annual Report of the Council for 1880.
Report at the Annual General Meeting held December 21, 1880.
Address of James Abernethy, President. January 11, 1881.
Dredging and other Plant employed at the Quebec Harbor Works. St. George J. Boswell.
The Monte Penna Wire Ropeway. William P. Churchward.
Sandy Island Lighthouse, Antigua, West Indies. L. A. E. Mackinnon.
The Co-Efficient of Friction of Air Flowing in Long Pipes. William C. Unwin.
The River Weaver Navigation. John W. Sanderman.
Machinery for Steel-Making by the Bessemer and the Siemens Processes. Benjamin Walker.

From Institution Mechanical Engineers, Walter R. Browne, Secretary, London:

Proceedings. August, 1880. Barrow Meeting

From the Iron and Steel Institute, London:

Journal of the Institute. No. 2. 1880.

From Hon. Edward Learned, New York:
The Tehuantepec Inter-Ocean Railroad. Alex. D. Anderson.

From Lyceum of Natural History, Albert R. Leeds, Cor. Secretary, New York:
Index and Contents. Annals of the Lyceum Vol. XI. No. 13. New York, 1876.

From Massachusetts Institute of Technology, Boston:
Abstract of Proceedings of the Society of Arts for 1879–80.
Sixteenth Annual Catalogue of the Officers and Students of the Institute 1880–81.

From Miles Meriwether, Memphis, Tenn.:
Biennial Report of President of Fire and Police Commissioners of Taxing District, Memphis, Tenn. December 1, 1880. (2 Copies.)

From Midland Institute Mining, Civil and Mechanical Engineers, Barnsley, England:
Transactions, September, October and November, 1880.

From George S. Morison, New York:
Forty-sixth Annual Report of Eastern Railroad Co. Boston, 1880.
Detailed plans, &c. Plattsmouth Bridge, Nebraska. Geo. S. Morison, Chief Engineer.

From New York Academy of Sciences, New York:
Annals. September, 1879, March and April, 1880.

From Edward P. North, New York:
Hackney Carriages. Tables of Distances within a circle of four miles radius from Charing Cross, London. 1878.

From North of England Institute, Mining and Mechanical Engineers, Theo. Wood Bunning, Secretary, Newcastle-on-Tyne, England:
Transactions. September, October and November, 1880.

From W. C. Oastler, New York:
Hints about Roadways and Steam Road-Rolling. W. C. Oastler, New York. 1881. 3d Edition.

From P. A. Peterson, Montreal, Canada:
Report to Quebec, Montreal, Ottawa and Occidental Railway Commissioners on the propriety of changing the Terrebonne location of the North Shore Railway, between the Western Edge of the "Grand Savane" and Montreal, back to the original or Bout de l'Isle route. P. A. Peterson. Quebec. 1880.

From Edward S. Philbrick, Boston:
American Sanitary Engineering. E. S. Philbrick. New York, 1881.

From Pi Eta Scientific Society, Troy, N. Y.:
Papers read before the Society as follows: Vol. II., No. 1.
Notes on Railroading. A. L. Waddell.
Theory of the Masonry Arch. Wm. H. Burr.
Braced Iron Piers. Thomas M. Cleemann.

From Edward Prince, Quincy, Ill.:
Sny Island Levee. A History of Legislation relating to it, and a Criticism of the System of Engineering adopted. Were the Levees properly and scientifically constructed? E. Prince. 1880.

From F. C. Prindle, U. S. Navy Yard N. Y.:
Annual Reports of Engineer in charge of Construction Washington Monument, years ending November 30, 1879 and 1880. Col. Thos. Lincoln Casey,
Report of Commission showing extent and progress made in the work for the completion of Washington Monument, and the amount of money expended.

From Publishers Révue Génerale des Chemins de fer. Paris.
Revué Generale des Chemins de fer. October and November, 1880.

From I. W. Raymond, San Francisco:
San Francisco System of Wire Rope Street Railroads.

From Col. W. Milnor Roberts, Rio de Janeiro, Brazil:
Report of Hydraulic Commission to examine Sao Francisco River 1879–80. W. Milnor Roberts, Chief Engineer, Rio de Janeiro. 1880.

From Hon. Horatio Seymour, Jr., State Engineer and Surveyor, Albany, N, Y.:
Report on Prosperity of New York Canals. Horatio Seymour. Albany, 1881. (Several copies.)

From T. Guilford Smith, Buffalo, N.Y.:
Statement of the present condition of Philadelphia and Reading Railroad and Phila. and Read. Coal and Iron Co. with plans for their further financial reorganization. Franklin B Gowen, 1880.

From Société des Ingenierus Civils Paris:
Memoires. October, November and December, 1880,

From St. Louis Public School Library, St. Louis:
Bulletin. No. 11. September–October, 1880.

From Americus Symmes, Louisville, Ky.:
The Symmes Theory of Concentric Spheres. John C. Symmes. Louisville, 1878.

From United States Association of Charcoal Iron Workers, John Birkinbine Secretary, Harrisburg, Pa.:
Journal of the Association. Vol. II, No. 1. January, 1881.

From United States Light House Board, Washington, D. C.:
Annual Report of the Light House Board for year ending, June 30, 1880.
List of Beacons, Buoys, Towers and other Day Marks in the Eighth Light House District, corrected to December 31, 1880.

From United States Naval Institute, Annapolis, Md.:
Proceedings. Vol. VI. No. 13.

From D. H. Van Auken, Cohoes, N. Y.: Photograph and Description of Centering Arch over New Canal through Ontario St., Cohoes, N. Y. D. H. Van Auken, C. E. 1880.

From A. F. Wrotnowski, New Orleans: Report of the Louisiana Land Reclamation Company. Columbus H. Allen. New Orleans, 1880,

From other sources:

Proceedings of the meeting to draw up Articles of Association between sundry Engineering Societies and Clubs for the purpose of securing a joint Publication of Proceedings, held at Chicago, December 4, 1880.

Reference Catalogue of Current Literature. New York, 1880.

Annual Report of Columbia Oil Co. Pittsburgh, 1880.

The Library Journal. Vol. V. Nos. 11-12. Vol. VI. No. 1.

ANNOUNCEMENTS.

The Thirteenth Annual Convention of the Society will be held at Montreal, Canada, on June 15th, 1881. The Board of Direction has been requested to make arrangements for the Convention. These are in progress and will be announced as soon as possible.

The following resolutions were adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad, and whereas it is desirable that the relation of the units of the differing systems be made familiar to all by comparison:

Resolved, That members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.

The House of the Society is at 104 East Twentieth street, one door east from Fourth avenue, and near the southwest corner of Gramercy Park. It is open from nine o'clock A.M. to five o'clock P.M. each business day, except Saturday, when it is closed at three o'clock P.M.

The Library and Conversation Rooms will also, for the present, be open every *Wednesday evening* from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Wednesday evenings both for consultation of books and periodicals and for conversation.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

	Date of Election.
ARCHER, WILLIAM.....Engineer Marietta & Cincinnati R. R. Cincinnati, Ohio.....	March 2, 1881
BENTLEY, HENRY A.....Newport, R. I.....	" "
ELY, THEODORE N.....Superintendent Motive Power Department P. R. R., Altoona, Pa.....	" "
REECE, BENJAMIN.....Engineer M. S. Division L. S. & M. S. Railway, Toledo, Ohio.....	" "
WIMMER, SEBASTIAN.....Chief Engineer New York City & Northern R. R., Room 56, Drexel Building, New York.....	" "

From Hon. Edward Learned, New York:
The Tehuantepec Inter-Ocean Railroad. Alex. D. Anderson.

From Lyceum of Natural History, Albert R. Leeds, Cor. Secretary, New York:
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Papers read before the Society as follows: Vol. II., No. 1.
Notes on Railroading. A. L. Waddell.
Theory of the Masonry Arch. Wm. H. Burr.
Braced Iron Piers. Thomas M. Cleemann.

From Edward Prince, Quincy, Ill.:
Sny Island Levee. A History of Legislation relating to it, and a Criticism of the System of Engineering adopted. Were the Levees properly and scientifically constructed? E. Prince. 1880.

From F. C. Prindle, U. S. Navy Yard N. Y.:
Annual Reports of Engineer in charge of Construction Washington Monument, years ending November 30, 1879 and 1880. Col. Thos. Lincoln Casey,
Report of Commission showing extent and progress made in the work for the completion of Washington Monument, and the amount of money expended.

From Publishers Révue Générale des Chemins de fer. Paris.
Revué Generale des Chemins de fer. October and November, 1880.

From I. W. Raymond, San Francisco:
San Francisco System of Wire Rope Street Railroads.

From Col. W. Milnor Roberts, Rio de Janeiro, Brazil:
Report of Hydraulic Commission to examine Sao Francisco River 1879-80. W. Milnor Roberts, Chief Engineer, Rio de Janeiro. 1880.

From Hon. Horatio Seymour, Jr., State Engineer and Surveyor, Albany, N. Y.:
Report on Prosperity of New York Canals. Horatio Seymour. Albany, 1881. (Several copies.)

From T. Guilford Smith, Buffalo, N.Y.:
Statement of the present condition of Philadelphia and Reading Railroad and Phila. and Read. Coal and Iron Co. with plans for their further financial reorganization. Franklin B. Gowen, 1880.

From Société des Ingenierus Civils Paris:
Memoires. October, November and December, 1880,

From St. Louis Public School Library, St. Louis:
Bulletin. No. 11. September-October, 1880.

From Americus Symmes, Louisville, Ky.:
The Symmes Theory of Concentric Spheres. John C. Symmes. Louisville, 1878.

From United States Association of Charcoal Iron Workers, John Birkinbine Secretary, Harrisburg, Pa.:
Journal of the Association. Vol. II, No. 1. January, 1881.

From United States Light House Board, Washington, D. C.:
Annual Report of the Light House Board for year ending, June 30, 1880.
List of Beacons, Buoys, Towers and other Day Marks in the Eighth Light House District, corrected to December 31, 1880.

From United States Naval Institute, Annapolis, Md.:
Proceedings. Vol. VI. No. 13.

From D. H. Van Auken, Cohoes, N. Y.: Photograph and Description of Centering Arch over New Canal through Ontario St., Cohoes, N. Y. D. H. Van Auken, C. E. 1880.

From A. F. Wrotnowski, New Orleans: Report of the Louisiana Land Reclamation Company. Columbus H. Allen. New Orleans, 1880,

From other sources:
Proceedings of the meeting to draw up Articles of Association between sundry Engineering Societies and Clubs for the purpose of securing a joint Publication of Proceedings, held at Chicago, December 4, 1880.

Reference Catalogue of Current Literature. New York, 1880.

Annual Report of Columbia Oil Co. Pittsburgh, 1880.

The Library Journal. Vol. V. Nos. 11-12. Vol. VI. No. 1.

ANNOUNCEMENTS.

The Thirteenth Annual Convention of the Society will be held at Montreal, Canada, on June 15th, 1881. The Board of Direction has been requested to make arrangements for the Convention. These are in progress and will be announced as soon as possible.

The following resolutions were adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

Whereas, the metric system of weights and measures is now extensively used abroad, and whereas it is desirable that the relation of the units of the differing systems be made familiar to all by comparison:

Resolved, That members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.

The House of the Society is at 104 East Twentieth street, one door east from Fourth avenue, and near the southwest corner of Gramercy Park. It is open from nine o'clock A.M. to five o'clock P.M. each business day, except Saturday, when it is closed at three o'clock P.M.

The Library and Conversation Rooms will also, for the present, be open every *Wednesday evening* from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Wednesday evenings both for consultation of books and periodicals and for conversation.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

	Date of Election.
ARCHER, WILLIAM.....Engineer Marietta & Cincinnati R. R. Cincinnati, Ohio.....	March 2, 1881
BENTLEY, HENRY A.....Newport, R. I.....	" "
ELY, THEODORE N.....Superintendent Motive Power Department P. R. R., Altoona, Pa.....	" "
REECE, BENJAMIN.....Engineer M. S. Division L. S. & M. S. Railway, Toledo, Ohio.....	" "
WIMMER, SEBASTIAN.....Chief Engineer New York City & Northern R. R., Room 56, Drexel Building, New York.....	" "

JUNIORS.

		Date of Election.
BALDWIN, WARD.....	Assistant Engineer Cincinnati Southern Railway, Cincinnati, Ohio.....	March 2, 1881
HOLBROOK, FRANCIS N...	Care J. P. Holbrook, P. O. Box 1624, New York.....	" "

CHANGES AND CORRECTIONS.

BILLIN, CHARLES E..... Indianapolis, Ind.

CHITTENDEN, S. H..... Sup't Lake Valley Mining Co., Lake Valley, N. M.

GREENE, BENJAMIN H.... Chief Engineer New Orleans Pacific R.R., Shreveport, La.

HARLOW, JAMES H..... Engineer Monongahela Navigation Co., 81 Wood Street, Pittsburgh, Pa.

JOHN, IRVIN..... Fleming Building, Room 6, Jersey City, N. J.

MCCLINTOCK, W. H.... Assistant Engineer Louisville & Nashville R. R., Bowling Green, Ky.

NICOLLS, WILLIAM J..... General Manager Snowshoe Coal Co., Bellefonte, Pa.

POST, JAMES C ..... Captain of Engineers, U. S. A., Newburgh, N. Y.

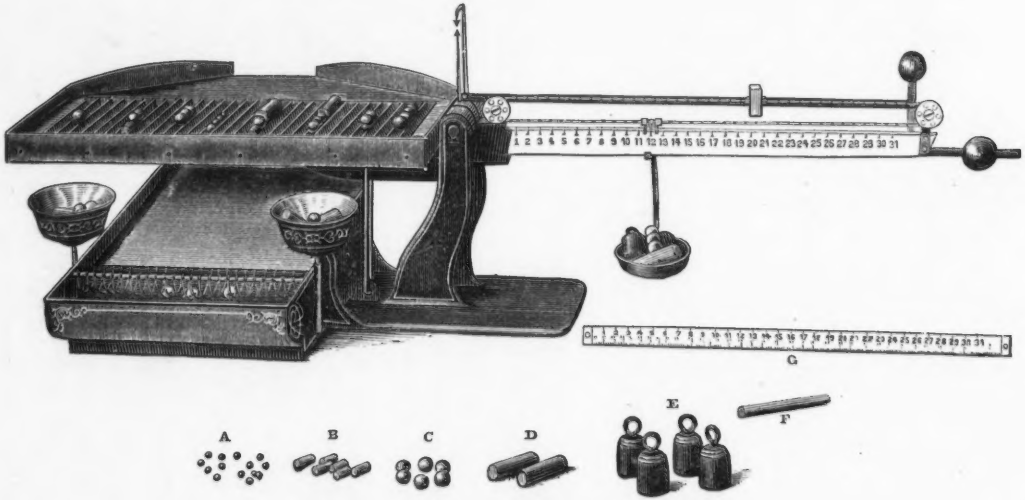
STEPHENS, CLINTON F.... Chief Engineer Texas & St. Louis Railway, Corsicana, Texas.

WISNER, GEO. Y..... 2828 Washington avenue, St. Louis, Mo.

WURTELE, A. S. C..... New York Central & Hudson River Railroad, 19 Jay street, Albany, N. Y.

JUNIOR.

WHITNEY, SAMUEL..... New Orleans & North Eastern R. R., Meridian, Miss.



AVERAGING MACHINE.

PLATE XXIII.

PATENTED DEC. 21, 1880.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. VII.—April, 1881.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

APRIL 6TH, 1881.—The Society met at 8 P. M. Vice-President Chanute in the Chair.

Ballots were canvassed and the following candidates declared elected: As Member, Charles Rufus Boyd of Wytheville, Va.;—As Associate, Henry H. Gorringe, of New York;—As Junior, Edward Butts, of Kansas City, Mo.

The Secretary reported that the date of the next Annual Convention was fixed as June 15th, and that arrangements were in progress as to the proceedings at that date at Montreal.

The Board of Direction reported the results of their action in reference to securing more permanent quarters, and brought to the notice of the Society the house No. 127 East Twenty-third street, New York.

The following resolution was adopted: That the Board of Direction be authorized to purchase the property No. 127 East Twenty-third street, at a price not exceeding thirty thousand dollars.

In order to secure this property a payment of $5,000 was required. The subscription to the Building Fund did not yet amount to $10,000, and under the terms could not be immediately called in. The following named ten members of the Society advanced the sum of five hundred dollars each, to be repaid from subscriptions: James B. Francis, O. Chanute, Ashbel Welch, E. S. Chesbrough, William E. Worthen, Walter Katté, Charles Macdonald, L. B. Ward, A. L. Holley, Eckley B. Coxe.

A paper by F. Collingwood, Member A. S. C. E., on "An Examination into the Methods of Determining Wind Pressures," was read by the author and discussed by Messrs. Chanute, Chesbrough and Worthen.

APRIL 20TH, 1881.—The Society met at 8 P. M. Past President Greene in the Chair.

A paper by G. Thomas Hall, Member A. S. C. E. Subject; "The Construction of the Second Avenue Line of the Metropolitan Elevated Railroad of New York," was read by the Secretary and discussed by Members present.

OF THE BOARD OF DIRECTION.

FEBRUARY 25TH, 1881.—Applications were considered. The Secretary was directed to make preliminary arrangements for the next Annual Convention. A form for an additional circular in reference to the collection of a Building Fund was determined upon and its issue ordered. Appropriations were made.

MARCH 23D, 1881.—Applications were considered. Arrangements for the approaching Annual Convention were discussed. Appropriations were made.

APRIL 5TH, 1881.—Applications were considered. Arrangements for the Convention were made. The following resolutions were adopted:

Resolved, That Messrs. W. H. Paine, C. Vandervoort Smith and Joseph P. Davis, be instructed to act as Trustees for the Building Fund, with instructions to collect the same from the subscribers and to deposit the proceeds in some trust company or savings bank offering due security, so that the signatures of at least two of the Trustees or their successors shall be required to draw out the funds.

Resolved, That the Building Fund shall only be invested upon an order signed by a majority of the whole Board of Direction.

The Secretary reported as to a number of houses examined by him, giving location, size and price. A committee was appointed to further examine houses suitable for purchase and to present the subject at the next meeting of the Society.

APRIL 23D, 1881.—Applications were considered. Resolutions were adopted as advised by the Counsel of the Board in reference to the purchase of the property No. 127 East Twenty-third street, New York, and as to the execution of a bond and mortgage on the same by the designated officers of the Society.

Arrangements were made as to the occupation of the new Society House.

ANNOUNCEMENTS.

The Thirteenth ANNUAL CONVENTION of the Society will be held at MONTREAL, CANADA, JUNE 15TH, 1881. Arrangements are in progress to have such of the Members as desire to do so, meet at Niagara Falls on Saturday, June 11th, and examine the new suspended structure of the railroad suspension bridge, and the re-enforcement of its anchorage. A paper on this subject will be presented at the Convention by L. L. Buck, Member A. S. C. E., the Engineer in charge of the work.

After spending Sunday at Niagara, the party will proceed to Toronto, and after a short stay at that city, will go to Montreal by a steamer, on Lake Ontario, passing on Tuesday the Thousand Islands and the Rapids of the St. Lawrence, and arriving at Montreal the evening before the day of the opening of the Convention.

The arrangements at Montreal are in charge of a Committee, and will be duly announced.

Members who cannot make the trip by way of Niagara and Toronto can go directly to Montreal, and should arrive there by June 15th.

Possession of the newly purchased HOUSE OF THE SOCIETY has been obtained during the last week of April. Its location is No. 127 EAST 23D STREET. It is near Madison Square, the great hotels, and the stations of the Elevated Railroads, and has a number of lines of surface street railroads in the immediate vicinity.

The House of the Society will, as heretofore, be open from nine o'clock A. M. to five o'clock P. M. each business day except Saturday, when it is closed at three o'clock P. M.

The Library and Conversation Rooms will also, for the present, be open every *Wednesday evening* from 7½ to 10 P. M. Members are invited to avail themselves of the opportunities afforded on Wednesday evenings for consultation of books and periodicals, and also for conversation.

The following resolutions were adopted at the Ninth Annual Convention of the Society, and ordered printed regularly in the Society publications:

***Whereas*, the metric system of weights and measures is now extensively used abroad, and whereas it is desirable that the relation of the units of the differing systems be made familiar to all by comparison:**

***Resolved*, That members be requested, in papers hereafter presented to the Society, to write, in parenthesis, weights or dimensions by the metric system, in connection with those of the system in general use.**

ADDITIONS TO

LIBRARY AND MUSEUM.

From Administration des Ponts et Chaussées, Paris:
Annales. January, 1881.

From American Society Mechanical Engineers, Thomas Whiteside Rae, Secretary, New York:
Proceedings. 1st Annual Meeting American Society Mechanical Engineers. New York, November 4 and 5, 1880.
President's Inaugural Address at First Annual Meeting American Society Mechanical Engineers. R. H. Thurston, New York.
An Adaption of Bessemer Plant to the Basic Process. A. L. Holley, New York.
The Field of Mechanical Engineering. A. L. Holley, New York.
High Ratios of Expansion and Distribution of Unequal Pressure in Single and Compound Engines. J. C. Hoadley.

The Metric System; is it wise to introduce into our Machine Shops. Coleman Sellers.
Friction as a Factor in Motive Power Expenses. Prof. John E. Sweet.

From Argentine Scientific Society, Don Eduardo E. Clerice, Secretary, Buenos Ayres:
Annales. January, 1881.
La Vida y Costumbres de los Termitos.

From Appleby Brothers, London:
Appley's Handbook of Machinery.
Section 1. Prime Movers.
" 2. Hoisting Machinery.
" 3. Pumping Machinery.

From Capt. Douglas Galton, London:
The Effect of Brakes on Railway Trains. 1st Paper. Douglas Galton.
Effect of Brakes on Railway Trains. 2d Paper. Donglas Galton.
Effect of Brakes upon Railway Trains. Douglas Galton.
Recent Brake Experiments upon the Lyons Railway. M. George Marie. London.
Memorandum on Brake Experiments made on the North Eastern Railway Co., at York, on July 14 and 15, 1879, upon a train fitted with the Westinghouse Automatic Brake. Douglas Galton.
Reports on Brake Experiments made at Gisburn on the Lancashire and Yorkshire Railway, July 14 and 15, 1880. Douglas Galton.

From J. M. Goodwin, Cleveland:
The Panama Ship Canal and Inter-oceanic Railway Projects. J. M. Goodwin. Cleveland, 1880.

From R. Gordon, Henzada, British Burmah:
Report on the Irrawaddy River.
Part 1. Hydrography of the Irrawaddy.
Part 2. Hydrology of the Irrawaddy.
Part 3. Hydraulics of the Irrawaddy.
Part 4. The Hydraulic Works connected with Nawoon River. R.Gordon. Rangoon, 1880.

From Charles A. Ashburner, Philadelphia:
The Geology of McKean County and its connection with that of Cameron, Elk and Forrest. Charles A. Ashburner, Harrisburgh, 1880.
Maps and Charts of McKean Co., Penna. Charles A. Ashburner. Harrisburgh, 1880.

From William S. Barbour, Cambridge, Mass.:
Mayor's Address and Annual Reports of City of Cambridge, Mass. Cambridge, 1881.
Annual Report City Engineer Cambridge, November 3, 1880. Cambridge, 1881.
Sixteenth Annual Report Cambridge Water Board. Cambridge, 1881.

From Board of Supervisors, John A. Russel, Clerk, San Francisco, Cal.:
Municipal Reports of San Francisco for year ending June 30, 1880.

From Boston Society of Civil Engineers. S. E. Tinkham, Secretary, Boston:
Proceedings January and February, 1881.
Railroad Signals. Geo. W. Blodgett.
Report on Metric System.
Fall River Bridge. E. N. Winslow.

From H. W. Clarke, Syracuse, N. Y.:
Report of Commissioners of New York and Pennsylvania Boundary Line to the Regents of the University of the State of New York. Albany, 1881.
Report of the Regents of the University of the State of New York on Resurvey of the Boundary line, New York and Pennsylvania. Albany, 1880.

From A. Durand-Claye, Paris, France:
Conferences sur l'Assainissement Municipal. Ecole des Ponts et Chaussées, 1871, 1875. A. Durand-Claye, Paris.
Sur les temprièture des eaux sunterraines de Paris pendant les Mois de Decembre, 1879. A. Durand-Claye. Paris, 1879.
Enquête sur les Stations Agronomiques. A. Durand-Claye. Paris, 1878.
Communication sur l'assainissement des Villes. A. Durand-Claye. Paris, 1880.
Mémoire sur le Déssechement du lac Funcino. A. Durand-Claye. Paris, 1878.
Etat de la Question des Eaux d'Egout en France et al 'Etranger. A. Durand-Claye. Nancy. 1877.
Situation de la Question des Eaux d'Egout et de leur emploi Agricole en France et a l'Etranger. A. Durand-Claye. Paris, 1873.

From M. Coryell, Lambertville, N. J.:
Fourth Annual Report of Lambertville Water Co. Lambertville, 1877.

From James B. Eads, St. Louis:
The Isthmus Ship Railway, *North American Review*. March, 1881. James B. Eads. 1881.

From John W. Hill, Cincinnati:
Report of the Expert on the Test Trials of Automatic Cut-off Steam Engines at the First Millers International Exhibition, Cincinnati, June, 1880.

From W. R. Hutton, Baltimore:
Three Photographs showing Lock and Dam of Kanawha River Improvement.

From Institution of Civil Engineers, James Forrest, Secretary, London:
Abstract of Papers in Foreign Transactions and Periodicals. Session 1880-81. Part I.
New Zealand and Ceylon Government Railways. James P. Maxwell and James R. Mosse.
The Different modes of erecting Iron Bridges. Theophilus Seyrig.
Ultimate Working Strength of Materials. Dr. J. Weyrauck.

From Institution Mechanical Engineer, Walter R. Browne, Secretary, London:
Proceedings. October, 1880.
Index, Contents and List of Members, Institution of Mechanical Engineers for 1880.
On Implements and Machinery for Cultivating Land by Horse Power. W. R. Bunsfould.
On recent improvements in the Machinery for Reparing and Spinning Cotton. Eli Spencer.

From W. S. Johnston, Chester, Pa.:
Memoir of Edwin Ferry Johnson, Civil Engineer. Philadelphia, 1880.

From Louis H. Knapp, Buffalo, N. Y.:
Specifications for the Intercepting Sewer, City of Buffalo.

From Charles Neilson, New York:
Drawings accompanying the report of Capt. Turnbull on Surveys and Construction of Alexandria Aqueduct, July 2, 1838. Washington, 1838.

From Publishers Révue Génerale des Chemins de fer. Edgar Monjean, Secretary, Paris:
Rèvue Generale des Chemins de fer. December, 1880.

From Royal United Service Institution, Capt. B. Burgess, Secretary, London:
Journal of the Institution. Vol. XXIV. No. CVIII.

From William F. Shunk, New York:
Gilbert Elevated Railway; a collection of facts in reply to the pamphlet "The opinions of Two Eminent Civil Engineers" on Rapid Transit. Wm. F. Shunk, New York, 1877.

From Société des Ingenieurs Civil. Paris:
Memoires, December, 1880, and January, 1881.

From St. Louis Public School Library:
Bulletin No. 12. November and December, 1880.

From United States Coast Survey, Washington:
Annual Report United States Coast and Geodetic Survey, 1877. Washington, 1880.

From U. S. Naval Observatory, Rear Admiral John A. Rogers, Supt., Washington:
Reports on the Total Solar Eclipses of July 29, 1878, and January 11, 1880. Washington, 1880.

From William Watson, Boston:
A report to the American Social Science Association on Protection of Life from Casualties in the use of Machinery. William Watson. Boston, 1879.

From Welton and Bonnett, Waterbury, Ct.:
Fourteenth Report of the Board of Water Commissioners of the City of Waterbury. Waterbury, 1881.

From H. M. Wightman, Boston:
Annual Report of the City Engineer of Boston for the year 1880 (2 Copies.)

From other sources:
The Library Journal. Vol. VI. No, 12.
The Architectural Employment of Terracotta. A Reprint from *The Builder*, August 14 and 11, 1880. New York, 1881.
Length of Tracks of Railroads owned, leased, operated, and controlled by the Pennsylvania Railroad Co. December 31, 1880.
Twelfth Annual Report of the Board of Railroad Commissioners of Massachusetts. Boston, 1881.
Narrative of the Second Artic Expedition made by Charles F. Hall. Prof. J. E. Nourse. Washington, 1879.
Narrative of the North Polar Expedition U. S. Ship Polaris, Capt. Charles F. Hall, Commanding. C. H. Davis, U. S. N. Washington, 1876.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

		Date of Election.
ALDRICH, TRUMAN H.	Montevallo Coal Mines, Montevallo, Ala.	May 4, 1881
BLAND, GEORGE P.	(Elected Junior, April 7th, 1875,) 3214 Woodland Ave., W. Philadelphia, Pa.	" "
BOYD, CHARLES R.	Wytheville, Va.	April 6, 1881
LEWIS, SIDNEY F.	Ass't. State Engineer, 289 Royal St., New Orleans, La.	May 4, 1881

ASSOCIATE.

HADDOCK, ARBA R.	410 E. 14th St., New York City, N. Y.	May 4, 1881

JUNIORS.

BUTTS, EDWARD.	Ass't. Engineer Kansas Pacific Railway, Erie, Col.	April 6, 1881
FERRY, CHARLES A.	Ass't. City Engineer, 18 City Hall, New Haven, Conn.	May 4, 1881
POETSCH, CHARLES J.	Ass't. City Engineer, Milwaukee, Wis.	" "

CHANGES AND CORRECTIONS.

MEMBERS.

CHILDS, JAMES E.....Gen. Supt. New York, Ontario and Western R. R., Middletown, N. Y.
CLARKE, THOMAS C.....49 William St., Room 58, New York City, N. Y.
COGSWELL, WILLIAM B...109 Willow St., Syracuse, N. Y.
CORTHELL, E. L.....North Egremont, Mass.
FALCONNET, EUGENE F..Pres. and Engineer N. & T. R. R., Nashville, Tenn.
FORCE, CYRUS G., JR....Cleveland, Ohio.
GLOVER, O. L.....Engineer Iquique R. R., Iquique, Peru, S. A.
HARDING, GEORGE E.....40 Exchange Place, New York City, N. Y.
HARDING, HENRY .....P. O. Box 280, Salem, Mass.
HUGHES, WILLIAM M....Engineer Bridges N. Y. C. & St. L. Rwy., 32 Board of Trade, Cleveland, Ohio.
KINSLEY, THOMAS P.....Horseheads, Chemung, Co., N. Y.
LEVERICH, GABRIEL.....Engineers' Office East River Bridge, 279 Front St., New York City, N. Y.
MCLAIN, LOUIS R.....Res. Eng. Rope Ferry Bridge, Lorraine, Va.
MEIER, EDWARD D .....214 Pine St., St. Louis, Mo.
SCHMIDT, MAX E.....Care James Harrington, Tampico, Mexico.
SEDGWICK, THOMAS S....1009 O St., N. W. Washington, D. C.
SICKELS, T. E.....90 Broadway, New York City, N. Y.
SITES, WILMON W. C.....Chief Engineer Board Public Works, Jersey City, N. J.
TOWLE, STEVENSON.....Engineer in charge of Sewers, 25 Chambers St., New York City, N. Y.
WILSON, HENRY W.....435 Chestnut St., Philadelphia, Pa.
WILSON, JOHN A... .....435 Chestnut St., Philadelphia, Pa.
WILSON, JOSEPH M.....435 Chestnut St., Philadelphia, Pa.
WIMMER, SEBASTIAN.....71 Broadway, New York City, N. Y.

ASSOCIATES.

HARRIS, CHARLES M.....67 William St., New York City, N. Y.
LAWSON, L. M.... .....102 Broadway, New York City, N. Y.

JUNIORS.

CROSBY, B. L.....Ass't. Engr. Bismarck Bridge, Bismarck, Dak.
LUCAS, D. JONES.....Lock Box 33, Lebanon, Pa.
STAATS, ROBERT P.....39 W. 12th St., New York City, N. Y.

FELLOWS.

COURTWRIGHT, MILTON. .55 Broadway, New York City, N. Y.
GURNEE, W. S.... .....35 Nassau St., New York City, N. Y.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. VII.—May, 1881.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

MAY 4TH, 1881.—The Society met for the first time in its newly purchased house, at 8 P. M. Past President Greene, in the chair.

Ballots were canvassed, and the following candidates declared elected: As Members—Truman H. Aldrich, of Montevallo, Ala.; William H. Atwood, of Jersey City, N. J.; George P. Bland (elected Junior April 7, 1875), Philadelphia; E. E. Glaskin (elected Junior April 5, 1876), London, Eng.; George T. Keith, of Olean, N. Y.; Sidney F. Lewis, of New Orleans, La.; Henry S. Munroe, of New York; Albert C. Savage, of Belle Plain, Texas; William N. Symington, of New York; Arthur M. Wellington, of Laredo, Mexico; Samuel Whinery (elected Junior April 1, 1874), Meridian, Miss. As Associate—Arba Read Haddock, of New York. As Juniors—Charles A. Ferry, of New Haven, Ct.; Charles J. Poetsch, of Milwaukee, Wis.

The Secretary reported that the property No. 127 East Twenty-third street, New York, had been purchased at the price of $30,000; that $5,000 cash had been paid, and a mortgage executed for the balance, $25,000, for five years, at 5 per cent. per annum, with a provision for the payment of any portion of this amount at any time in sums not less than $1,000. Also that the subscriptions now amount to $10,100, and that a circular had been prepared calling for their payment.

MAY 18TH, 1881.—The Society met at 8 P. M. Director Joseph P. Davis, in the chair.

The Secretary announced the death, on April 18th, 1881, of Max Maria, Baron Von Weber, Honorary Member of this Society, and the President was authorized to appoint a committee to prepare a memoir for publication.

A paper by Charles L. McAlpine, Member A. S. C. E., subject, "Quicksand in Excavation," was read by the author, and discussed by Messrs. Bogart, Joseph P. Davis, Raymond, Torrey, and Worthen.

OF THE BOARD OF DIRECTION.

MAY 7, 1881.—Applications were considered. The Treasurer reported the collection of over $5,000 of the Building Fund subscriptions, and was authorized to repay that amount to the members of the Society who had advanced the same for the first payment on the purchase of the property. The thanks of the Board were ordered transmitted to these gentlemen.

The Trustees of the Building Fund reported arrangements made for the deposit of its proceeds in a trust company.

The Secretary reported the preparation of the following circular, the issue of which was approved:

May 5, 1881.

SIR:

I am instructed to acquaint you with the fact that the property

No. 127 EAST TWENTY-THIRD STREET, NEW YORK,

has been purchased by the AMERICAN SOCIETY OF CIVIL ENGINEERS, and that during the past week the Society has taken possession, and will hereafter occupy the house at that location.

You have been informed, by previous circulars, of the establishment of a BUILDING FUND, and of the provision that subscriptions to that fund would be binding when $10,000 should be subscribed. During the month of March, many houses were visited and examined by the Board of Direction and the Committee entrusted with that duty; and at the meeting of the Society of April 6th, a report was made of the result of these examinations. It was then decided to purchase this house. To secure the property a payment of $5,000 was necessary. The subscriptions to the Building Fund, at that time, did not amount to $10,000, and, therefore, could not be called in. A prompt decision on the subject was necessary, because the lease of the house then occupied in Twentieth Street expired on May 1st, and had either to be renewed or given up at once. Ten members of the Society directly advanced $500 each. The title of the property was thoroughly examined and the purchase completed, by the payment of $5,000 on April 26th. The price of the property is $30,000, and on the remaining sum of $25,000 interest is

now running at 5 *per cent.* Since the purchase, subscriptions have been received, so that the total subscription is now $10,600. These will be directly called in, and the advance made by members repaid to them. The amount remaining due on the property will be reduced as subscriptions are paid, a provision allowing this being incorporated in the mortgage.

The house is twenty-five feet wide, about sixty feet deep, with a lot in the rear forty feet deep. The house is excellently built, with Ohio stone front and brick sides and rear. It is four stories high, with basement and cellar. It affords at once much more convenient accommodations than the Society has heretofore possessed for its library, its meetings, and for the general uses of members and visitors. The location and construction of the house are such as, in the opinion of careful judges of real estate, will assure its security as an investment and a probable advance in value.

This decided action of purchasing a house has been largely determined upon, in accordance with the advice and suggestions of many members of the Society to the effect that, in order to secure a Building Fund, some decided action was imperative.

The subscriptions have varied in amounts from small sums up to one of $2,500, which latter has been made by one member. Quite a number of subscriptions have been made by persons not members of the Society, to whom the suggestion of aiding in the establishment of this Fund has been made by members. One member has already forwarded sixteen subscriptions of $100 each. All subscriptions will be acknowledged and published as provided for in the circular of January 1st, 1881.

To reduce the interest account, and to enable the Society to devote its funds more entirely to its publications, and other suitable purposes, additional subscriptions are desired, and you are requested, as in previous circulars, to bring the subject to the attention of persons interested in Engineering, and who might probably be very willing to become subscribers to the Building Fund, and receive the Transactions of the Society, if the subject was presented to them.

Respectfully,

JOHN BOGART,
Secretary Am. Soc. C. E.

The Secretary also reported the preparation of the following circular, the issue of which was authorized :

AMERICAN SOCIETY OF CIVIL ENGINEERS,
127 EAST TWENTY-THIRD STREET,
NEW YORK,.....188 .

Mr.....

Sir,—Under the provisions of the circular issued on March 1st, 1881, the subscriptions to the Building Fund of this Society become binding when $10,000 shall be subscribed.

The subscriptions now amount to $10,600. You are therefore requested to forward the amount subscribed by you, either in two instalments or in one payment, as may be convenient. If made in two instalments, the first half should be sent directly, addressed to the Secretary, in draft or money orders made payable to the Treasurer of the American Society of Civil Engineers; the second half to be paid at your convenience on or before July 1st, 1881.

The amount subscribed by you was $.....

Respectfully,

JOHN BOGART,

Secretary Am. Soc. C. E.

The Secretary reported in full the transactions connected with the purchase of the property No. 127 East Twenty-third street, including the report as to title by the legal advisers of the Board, and the execution of the requisite papers by the designated officers of the Society. The Board approved the action thus taken.

Action was taken as to bank deposits and checks. The Finance Committee was requested to consider the question of a proper sum for compounding the annual dues now payable by members of the Society by the payment of such sum for constituting a life membership. Appropriations were made.

MAY 23D, 1881.—Arrangements for the 13th Annual Convention were considered.

MAY 25TH, 1881.—Arrangements for the 13th Annual Convention were made. The following was adopted as to invitations to the Convention:

Resolved, That invitations be extended to the families of members; that the Committee on Convention be empowered to invite individuals eminent in the profession, and editors of professional papers, and that the local committee at Montreal be requested to extend invitations at their discretion.

Resolved, That the Committee on Convention be requested to invite to the Convention the officers of Engineers' Societies, of the American Institute of Mining Engineers, and of the American Society of Mechanical Engineers.

Action was taken in reference to the investment of the Fellowship Fund. Applications were considered. Appropriations were made.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. VII.—June, 1881.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

THIRTEENTH ANNUAL CONVENTION OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS.

HELD IN THE CITY OF MONTREAL ON THE 15TH, 16TH, 17TH, AND 18TH OF JUNE, 1881.

FIRST SESSION—RECEPTION.

On the morning of Wednesday, the 15th, the Convention assembled in Molson Hall, McGill University.

Mr. JOHN BOGART, the Secretary of the Society, called the meeting to order, and said:

I am requested to open the Thirteenth Annual Convention of the American Society of Civil Engineers, and to say that we will be welcomed to the City of Montreal by His Worship the Mayor of the City. Previous to that, however, in accordance with the law of the Society, a Chairman of the Convention is to be elected from among members, not officers, of the Society; and in accordance with the custom, the local committee at Montreal have nominated as Chairman Mr. THOMAS C. KEEFER, and I now have much pleasure in presenting that nomination to the Convention.

The nomination was unanimously ratified, and Mr. Keefer took the Chair.

The CHAIRMAN.—It is proper, gentlemen, that the first words of welcome should be spoken to you by the only gentleman who is authorized to speak for the whole of the citizens of Montreal. I regret to say that his Worship the Mayor, who has come here with great difficulty, is unable, through illness, to perform that duty himself, but he has brought a substitute who will assure you of a hearty welcome to the city over which he presides.

MAYOR BEAUDRY.—Mr. President and gentlemen of the American Society of Civil Engineers, allow me to congratulate you upon your presence in the City of Montreal, and to welcome you and offer you the freedom of the city. I regret that I am unable to read the address which expresses so truly the sentiments I entertain in regard to your visit. It will be read to you by my son-in-law, who is also the city attorney of Montreal. I beg to introduce to you Mr. Roy.

Mr. ROY read the following address:

ADDRESS OF THE HON. J. L. BEAUDRY, MAYOR OF THE CITY OF MONTREAL, TO THE PRESIDENT AND MEMBERS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS, IN CONVENTION ASSEMBLED AT THE WM. MOLSON HALL OF MCGILL UNIVERSITY, ON WEDNESDAY, THE 15TH OF JUNE, 1881.

Mr. President and Members of the American Society of Civil Engineers:

I have the honor, in the name of our citizens, to welcome you and to offer you the freedom of this our City of Montreal. I believe it is the custom of your Society to hold a convention annually in some of the principal cities of the continent, and this is, I believe, your thirteenth, and the first one held outside of the limits of United States territory. I was about to say, your own country, as was recently remarked by one of our city newspapers in commenting upon your expected visit, but I will not make use of that phrase myself, because I think that, as engineers, men who are intimately identified with all the great enterprises which unite not only territories, but continents, in the great march of civilization and progress, it should not be said that you are not in your own country, merely because you have crossed the line which divides two distinct political governments. I am sure that the American engineer never feels out of his country in pursuing the objects of his noble profession; at all events, he need not feel so, while he is in this Canada of ours; the lines that mark differences in political institutions are obliterated in these pursuits; besides, are not the arms of your Society extended open to your professional brethren on this side of the line, and have we not, as citizens of Canada and in this city, men who are members of your honorable body, and to whom the privileges and honors of your institution are extended as fully and as freely as to those who live under the American flag. Your brethren here, I am very certain, do not look upon you as strangers out of your own country, but

they are, as you are yourselves, all members of one body that knows no difference in creed or nationality ; and the Montreal members must feel gratified in being the cause, as I have no doubt they are, of the honor of this distinguished visit to our city. In connection with this visit, my attention has been particularly drawn to the importance of your Society as an institution, and I have to offer you my humble congratulations on the aims and objects for which it exists. I have glanced over the subjects which claim your thought and study, and the manner in which, in your discussions, those subjects are treated, shows me how you probe and burrow for the truths of practical life, and prompts me to increase, if that were possible, my admiration for the noble profession of civil engineering ; that profession whose object, it has been truthfully said, is the improvement of everything it touches for the use, economy and convenience of man. It is to your profession, Mr. President and gentlemen, that we are indebted for the great highways of commerce that stretch far and wide over the continent from the Atlantic to the Pacific ; that has shortened the once almost trackless ocean between two great commercial worlds to a mere bagatelle of a trip ; that brings those magnificent ships to our harbors ; that has laid hold of the lightning and used it to link the whole civilized world in instantaneous communication ; that pierces our mountains to let the iron horse go through, and that bridges our rivers so that even our great St. Lawrence offers no obstacle to the transportation of our merchandise and our products at all seasons of the year. And I am aware that, in the intelligent assemblage which I have now the privilege of addressing, there are men who have done these things, and who are capable of doing and will do still greater than have yet been done ; minds which have conceived and carried to successful completion many of those bold projects, in the interests of commerce, which have astonished the world and won the admiration and gratitude of their fellow-citizens, and have brought honor to their country. It is to your profession also that we are indebted for many of the conveniences, comforts and even luxuries of daily life ; usefulness to your fellow-men, is your great aim, and many of you have placed your names high up on the roll of fame, both in this and the mother country, for your achievements in your art. It is, therefore, an honor to our city that, by an almost unanimous vote, you have selected her as the place for this meeting.

With regard to what we have to offer for your entertainment, I regret that we have not very much to show of that which is most interesting to you. The Victoria bridge and the workshops of the Grand Trunk Railway Company are worthy of your inspection ; the harbor also may present a feature of interest to you ; and, on behalf of the city works, there are the Water Works and the Mount Royal Park.

In conclusion, Mr. President and gentlemen, let me say that, although our city lies far north, the hearts of our people are warm, and, on behalf

of the citizens, accept my best wishes for your enjoyment here, and for the success of your meeting. And I hope that this will not be your last convention here; I also hope, on behalf of our Canadian engineers who are not members, that they will take advantage of the privileges your institution offers to them, and that the Canadian membership will augment, for we cannot shut our eyes to the fact that union of men, particularly in such noble pursuits as those of your calling, must tend largely to cement the friendly feeling which exists generally between the inhabitants of both sides of the line which separates our governments. Again, Mr. President and gentlemen, let me heartily welcome you and tender you the freedom of the city.

I have the honor to be,

J. S. BEAUDRY,
Mayor.

The Chairman then introduced

Mr. HENSHAW, President of the Montreal Board of Trade, who said:

When I had the honor of an invitation to meet this distinguished body, I had no idea that I was to be other than a silent spectator, and a very pleased one, of the proceedings of to-day. Had I imagined I should be called upon for anything in the way of a speech, I should have followed the example of our worthy Mayor, and made some little preparation for it. Occupying, as I do, the position of President of the Montreal Board of Trade, I cannot do less, certainly, than to welcome most heartily to this city so distinguished a body of gentlemen as have favored us with their presence. I have occasionally heard it remarked: "What practical good does a visit, such as this, do to a place?" I felt a pity for those who proposed such a question. For my part, I think the peculiar circumstances under which a visit of this kind is made, ought to be welcomed by the city with the greatest pleasure possible. The Civil Engineers are a class of men who are closely identified with the commercial interests of the whole world. They are naturally interested in, and competent to speak upon, railway lines, canals, and, in fact, every channel of intercourse between the west and the ocean through which commerce must pass, and, I think, under the circumstances, Montreal has been very highly honored by the presence of these gentlemen. I hope that the merchants of Montreal, and the citizens generally, will extend to them during their stay all the attentions they possibly can. We are particularly favored, also, by the presence of a large number of ladies who accompany the members of the society, and I trust they will receive such impressions of the city that we shall have the pleasure of seeing them again. In the name of the Board of Trade of Montreal, gentlemen, I offer you our warmest welcome.

The CHAIRMAN.—I now introduce to you another member of the Board of Trade, who is also a member of the Dominion Parliament, Mr. Thomas White.

Mr. WHITE.—I confess, Mr. Chairman, that I am very much surprised, indeed, at this summons, for, although a member of the Council of the Board of Trade, in the presence of our President, I think no one else should speak in their name. I cannot, however, do otherwise, as a citizen of Montreal, than very cordially to express my own gratification at the presence of so distinguished a body in our city, and to extend to you the heartiest possible welcome on the part of the citizens of Montreal. There is, perhaps, no city on the continent more interested in works to which your minds are specially directed, than is this City of Montreal at the present time. The charts on each side of this room indicate some of the works upon which the success and prosperity of Montreal depend, and upon the successful carrying out of these works, I believe, will very largely depend the future of our city. I sincerely trust, gentlemen of the American Society of Civil Engineers, that your stay in Montreal will be not only a pleasant one, but a profitable one in affording you an opportunity of seeing those works upon which the city has so far depended for its prosperity in the past, and those works which we are now entering upon. There is no class of men, no department of industry, or intellectual labor, upon which the future of the country, and even of this whole continent, so largely depends as upon the profession represented here to-day. If to-day we have railways extending over every part of this vast continent, we owe it to the skill, to the foresight, to the indomitable industry of the department of civil engineering. If to-day we have great water highways which afford means of communication for the traffic and business of the country, we owe it to that same department of labor. I sincerely congratulate the City of Montreal that it has been selected for the place of meeting of so distinguished a body of gentlemen. I have the honor again, gentlemen, to welcome you most heartily on behalf of the city, and to express my earnest hope that your visit here will be one which, when looking back upon it in the future, you will have no reason to regret.

Mr. MITCHELL, President of the Montreal Corn Exchange, said: When I came here I hardly expected to be called upon to speak, but I am glad to say that I heartily concur in what has been said by my friends of the Board of Trade, in welcoming the distinguished visitors we have with us. I wish the society that has so kindly favored us with this visit, every enjoyment during their stay here. I am sure that the association for which I speak welcomes them most heartily to Montreal, and unites with me in wishing them every enjoyment while sojourning in our city.

The CHAIRMAN.—It is now my pleasant duty to present to you a gentleman who requires no introduction from me, a gentleman whose reputation is trans-Atlantic as well as cis-Atlantic, Principal DAWSON, the distinguished geologist, who is the President of this University, and to whom we are indebted for the use of the hall in which we are assembled.

PRINCIPAL DAWSON.—I do not know that it is necessary for me to add words of welcome to those that have already been spoken, but I may say one word on behalf of the University which I represent here. I must say that it gives us very great pleasure, and we regard it as a very high honor, to be able to entertain within our walls the distinguished Society which meets here to-day. McGill University, in some respects, perhaps, has a claim on the profession of civil engineering because it was the first university in this Dominion to recognize that profession as a learned profession, and to establish a professorship and a course of study in connection with this branch of knowledge. We did it as far back as 1856, and for the last twenty years nearly, our young men have been going out more or less prepared for active duty on the public works of this country and its engineering enterprises.

That our action in this respect has been a wise one, is borne out by the growth of our engineering department, now united with the other professions of mechanical and mining engineering in our faculty of applied science, and by the public support which the effort has secured. The work of the engineer, based on scientific principles, and carrying out those great enterprises of construction, almost of creation, is undoubtedly one of the highest connected with the material advancement of nations. The engineer is, in truth, at once the missionary and the pioneer of material civilization in its extension into new fields, and as was very well stated in the address of the Mayor, he is the organizer of the means whereby the larger and denser communities of men can exist with comfort, can be supplied with the necessaries and luxuries of life, and can hold communication with each other. Without the structures which he plans, rears and maintains, the fabric of our modern civilization would fall asunder, and its political, social and commercial arrangements would disappear like a dream. We do well, therefore, to welcome you as representatives of this great and honorable profession, and of the science and culture which its achievements represent, and to throw open to you whatever we have in books, collections or other objects of interest.

Not being an engineer, I cannot refer to those works in which you are professionally interested, but as a geologist, I may introduce you to the ancient and venerable foundations on which our city stands, and which may afford a field for the exercise of the profession of civil engineering. The lower Silurian Limestone of the Trenton age, which underlies a great part of the Island of Montreal, though originally a congeries of organic fragments of shells and corals, has nevertheless attained to the hardness and density of marble, and is our chief material of construction, along with its companion beds, the Chazy and Black River limestones. That is our great substratum here in Montreal, and constitutes the material for our great works of construction, and that out of which all our best buildings are built. These limestones may well be seen in the extensive quarries near the city. The next formation in

ascending order is the thick and soft Utica shale, dipping gently to the south towards the country from which you come. Though soft and comparatively useless, it has nevertheless permitted our noble river to excavate that channel which you see represented on the wall, because rivers, like engineers, select the softest material for their work, and one which they can most easily excavate. That Utica shale, also, is the material in which our engineers expect to build this tunnel which you see represented on the wall, and which is to bind us, along with the Victoria Bridge, to the south shore of the St. Lawrence. We are also indebted to that Utica shale, crumbling and soft, for much of the fertility of the soil south of the river, from which much of the food supply of this city is derived. Then we have here to the north of us that mass of rock, Mount Royal, not great as a mountain, but great in relation to Montreal, a mass of igneous rock of Dioritic and Syenitic character, which, in old times has burst up through this Trenton limestone and Utica shale, and now lifts it head above our city. It affords the beautiful ground for our Mountain Park, and serves also the more homely use of supplying material to macadamize our otherwise bad and dusty streets. Dr. Hunt and Dr. Harrington have worked out much of the chemical and microscopic characters of this great and varied mass. In regard to that mountain, I am reminded by the chairman that we should value it more than we do at present if we could calculate how much it would have cost to put it there. Associated with the mountain in origin is the patch of volcanic breccia on St. Helen's Island, a remnant of the ancient cone of the Montreal volcano, and which, by its being associated with the fossils of the Upper Silurian age, fixes the age of the chief eruptions of our mountain. Lastly, in the much later Ledea clays and Saxicava sands of the Pleistocene age, overlaying the older formations, we have the materials of our durable, if not very beautiful, red bricks ; and in them the geologist can collect abundant specimens of marine shells, identical in species with those now living in the northern part of the Gulf of St. Lawrence, and indicating the submergence of our country under the cold waters of the Arctic sea in that age known as the Glacial period, and in which the imagination of certain extreme theorists would have us believe that our continent was covered with a mantle of solid ice. Montreal now profits by all these preparations of past geologic ages, and, having passed out of its Glacial age, can now welcome you to a summer clime, a rich vegetation, and the hospitality of a growing, if not yet great city. In conclusion, allow me to say, that the University, in offering the use of its hall to this society, also offers you all the conveniences and arrangements in connection with it ; the library and the museum rooms will be entirely at your service during your sojourn here, for we wish to do everything in our power to make it both pleasant and useful to you.

VICE-PRESIDENT WELCH, at the request of the President of the Society, responded on behalf of the Society as follows :

Mr. Chairman,—The worthy Mayor used one expression which runs against all my former conceptions. He spoke of the American Society of Civil Engineers in Montreal being out of their own country. Why, I thought Canada was in America! It does not make any difference whether some members of the society acknowledge as their Chief Magistrate the illustrious man who lives in the White House at Washington, while other members acknowledge as their sovereign that glorious woman whom we all love—not because she is Queen of Great Britain and Ireland and Canada—not because she is Empress of India—not because she rules over one-quarter of the human race, and that the best quarter—but because she realizes and exemplifies this sentiment :

> " The rank is but the guinea's stamp,
> The man's (or woman) the gowd, for a' that."

We feel that she's the "gowd." I say it does not make any difference which of the two we acknowledge as our Chief Magistrate, we are all Americans, and in the simplicity of my heart I thought the American Society of Civil Engineers embraced Canada as a matter of necessity. But, Mr. Chairman, this welcome, and one or two other welcomes to Canada that I have witnessed, remind me of a great contrast. In 1812 some Americans came over to a small place then called Little York, now the magnificent city of Toronto. Well, we were welcomed on that occasion by bayonets, bullets and grape shot, and we returned what they gave. Now, we have just heard these warm words of welcome, words used, I doubt not, in all sincerity, judging from our own feelings, because we attribute the same feelings to our fellow-citizens—I mean our friends—of the City of Montreal. We have heard of the great material benefits civil engineers have conferred upon this city—upon every part of the continent, and upon mankind. But that is not the highest object attained by the civil engineer. He has made the bonds that unite the North and South of the United States. Those bonds have healed the dissensions and mitigated the hostility that unfortunately existed at one time between those two sections. I believe that the railroads connecting North and South have done more than any other cause, except religion, to harmonize those sections of our common country. And so it is with other countries. Canada and the United States are now practically one people, though under different governments. That engineer has a very inadequate conception of his mission who considers that material good, commercial good, is the highest end of his profession. The real and highest result accomplished by the engineer is by the works he constructs, the railways, the telegraphs and

the steamships by which he unites the distant regions of the whole world, to assimilate, to civilize and to Christianize the human race.

The reception being ended, the Convention proceeded to the business of the day.

The Secretary made an announcement concerning the entertainments provided by the Local Committee.

A paper by L. L. Buck, M. A. S. C. E., subject, "The Re-enforcement of the Anchorage and the Renewal of the Suspended Structure of the Niagara Railway Bridge," was, in the absence of the author, read by the Secretary.

The Secretary announced that the Department of Railways and Canals at Ottawa had sent to Montreal, for the use of the members of the Convention, 100 copies of the last report of the Chief Engineer, containing illustrations of Canada's public works; also, railway maps; and, through Colonel Denis, of the Department of the Interior, 100 maps of those portions of the Northwest Territory opened up by the Canadian Pacific Railway.

Mr. Sanford Fleming, M. A. S. C. E., then read a paper, subject, "Uniform Standard Time for Railways, Telegraphs and Civil Purposes Generally."

A recess was then taken, during which occurred the drive to the Mountain Park and the garden party at the residence of Mrs. Redpath.

Evening Session, June 15th.—On the Convention reassembling at 8 P. M.,

The Chairman read a letter from the Managing Director of the Grand Trunk Railway, offering a special train for the conveyance of the members to Quebec; also, a letter from the Art Association of Montreal, extending an invitation to the Society to visit the Art Gallery; also, from the Secretary of the Mechanics' Institute of Montreal, inviting the Society to visit the library and reading-room; also, a telegram from Mr. Collingwood Schrieber, Chief Engineer of the Intercolonial Railway, offering free passage to members of the Convention wishing to visit the Maritime Provinces.

The Secretary made several announcements regarding the local programme, and stated that he had received a telegram from Mr. Benjamin Rhodes, Engineer in charge of the upper Suspension Bridge at Niagara Falls, tendering an invitation to the Society to hold its next Convention at that place.

The President, James B. Francis, then read the Annual Address, which will be printed in the Transactions.

On the suggestion of the Secretary, the Convention then proceeded to the consideration of Mr. Fleming's paper on "Standard Time for Railways and Telegraphs."

On motion, the following committee was appointed, with power to add to their number, to whom the paper presented by Mr. Sanford Fleming was referred for consideration and report: Sanford Fleming, of Ottawa, Canada; Charles Paine, of Cleveland, Ohio; A. J. Cassatt, of Philadelphia, Pa.; J. M. Toucey, of New York, N. Y.; J. E. Hilgard, of Washington, D. C.; T. Egleston, of New York, N. Y.; T. G. Ellis, of Hartford, Conn.

The paper on the Re-enforcement of the Anchorage and the Renewal of the Suspended Structure of the Niagara Railroad Bridge, by L. L. Buck, was then discussed by Messrs. A. P. Boller and E. S. Chesbrough.

A paper by O. Chanute, Vice-President of the Society, subject. "Repairs of Masonry," was, in the absence of the author, read by the Secretary, and discussed by members present.

Mr. J. J. R. Croes, for the Committee on the Engagement of Civil Engineers upon Government Works, presented the following report:

To the American Society of Civil Engineers, New York, June 14, 1881:

At a meeting of the Society, held during the Twelfth Annual Convention, at St. Louis, the following resolution was adopted:

"*Resolved*, That a committee of seven be appointed to prepare a memorial to Congress, asking that Civil Engineers may be placed in full charge of the works of public improvement carried on at Government expense, such memorial to be submitted to the Society, and voted on by letter ballot on the first Wednesday in November."

The committee appointed under the provisions of the above resolution beg leave to submit the following report:

It will be observed that the resolution under which this Committee was appointed specifies that the form of memorial reported by the Committee shall be submitted to the Society for letter ballot. This would seem to imply that the Society as a body shall be asked to accept the memorial, and present the same to Congress.

Your Committee, after maturely considering the subject, have thought it advisable to suggest that it may be inexpedient for the Society to place itself in the position of advocating before Congress the claims of a certain class of its membership, in seeming conflict with any other class whose interest may be in a different direction.

Your Committee have not lost sight of the fact that a large majority of the members of the Society are engineers practicing in civil life. Nevertheless, it must be borne in mind that some of our most prominent colleagues are, or have been, military engineers in the sense referred to in the memorial, and it may very well be questioned whether the Society, as a body, should commit itself to a line of action which might be construed as in the least inimical to the professional interests of any of its members.

The objects for which the Society was instituted are clearly defined in Articles II and III of the Constitution, which read:

"ART. II. Its object shall be: The professional improvement of its members, the encouragement of social intercourse among men of practical science, the advancement of engineering in its several branches, and the establishment of a central point of reference and union for its members.

"ART. III. Among the means to be employed for attaining these ends shall be periodical meetings for the reading of professional papers, and the discussion of scientific subjects; the foundation of a library; the collection of maps, drawings and models; and the publication of such parts of the proceedings as may be deemed expedient."

From all of which it would appear that, while the professional improvement of its members is to be considered as a prime motive, there should never be the least appearance of an attempt at discrimination in favor of a particular class of membership to the detriment of others.

Your Committee have acted upon this view in preparing the memorial.

It is intended to be an expression of opinion of such civil engineers as may sign and present it to Congress in furtherance of their own interests, and the Society may with propriety decline to consider the subject further.

The Committee respectfully request that they be discharged.

CHARLES MACDONALD,
J. J. R. CROES,
T. C. CLARKE.

[Form of Memorial.]

To the Senate and House of Representatives of the United States:

Your petitioners, citizens of the United States, and civil engineers by profession, beg leave to call your attention to the fact, that the civil engineering works now carried on by the General Government, such as the improvement of harbors and rivers, explorations and surveys for the extension of agriculture and commerce, etc., although they employ in positions of responsibility and trust a large number of civilians, are superintended, with one or two exceptions, exclusively by officers of the Corps of Engineers of the Army.

The number of such works is greater than the number of experienced officers who can be detailed to take charge of them, in addition to their other duties in the construction and maintenance of our national defenses.

Consequently, most of these works are practically in the hands of civilians, although occupying subordinate positions, and many of the most experienced civil engineers in the country, who are well fitted by skill and education to take principal charge, are unwilling to accept such positions, where neither adequate emolument nor reputation can be hoped for.

Your petitioners therefore pray that such legislation may be had as shall admit of the direct employment of civil engineers upon Government works in such positions as they may be competent to occupy, and shall put the civil and military engineers of the United States upon a common footing in regard to the execution of national public works not of a military character.

On motion, the report of the Committee was accepted and the Committee discharged.

The Convention then took a recess.

VISIT TO OTTAWA.

JUNE 16.—In the morning the members of the Convention embarked on a special train of the Q., M., O. & O. R.R., placed at their service by the Local Government of the Province of Quebec, and proceeded to Ottawa, the Capital of the Dominion, distant 115 miles from Montreal. At Ottawa they were received at the railway station by Sir Leonard Tilley, Finance Minister of the Dominion, the Hon. Mr. Caron, Minister of Militia, and by a local Reception Committee, whose names are given hereinafter. The party having visited the Chaudière Falls, and inspected the extensive saw mills situated there, made the descent of the timber slides upon cribs of squared timber which had been prepared for this purpose, and then drove to the Union House, where they were entertained with a collation. The following letters were received by the Secretary of the Committee.

From Sir H. L. LANGEVIN, Minister of Public Works for the Dominion of Canada:

W. B. SMELLIE,

C. E., Ottawa:

MY DEAR MR. SMELLIE,—I would have been very happy to avail myself of the kind invitation from the Reception Committee, thereby showing my appreciation of the visit to Ottawa of the body of American engineers; but, unfortunately, I had previously made an engagement which it is impossible for me to cancel. I am convinced that these gentlemen will receive at your hands every attention to which they are entitled and so honorably deserve, and that they will carry back with them a good and memorable souvenir in favor of our Canadian Capital.

Yours very truly,

HECTOR L. LANGEVIN.

From the Hon. D. L. MACPHERSON, Speaker of the Dominion Senate:

Mr. Macpherson regrets that a previous engagement will prevent his having the pleasure of assisting at the reception of the American Society of Civil Engineers this afternoon.

Ottawa, 16th June, 1881.

From the Hon. J. A. Mousseau, President of the Council of the Dominion:

Ottawa, June 16th, 1881.

W. B. Smellie, Esq.,
Engineer, Ottawa:

My Dear Sir,—It is only this morning that I had the honor to receive your invitation to attend the reception of the American Association of Civil Engineers, at 1 o'clock P. M. to-day. I am sorry previous engagements make it impossible for me to shake hands with the American and Canadian Engineers, who in this time of railways and canals, are the true pioneers of civilization, because they foster progress, prosperity, and international intercourse amongst the various nations in the world.

Most truly yours,

J. A. Mousseau.

Mr. C. H. Mackintosh, Mayor of Ottawa, presided at the collation. The first toast proposed and honored was that of "The Queen." The next toast was that of "The President of the United States."

The Hon. J. Q. Smith, Consul-General of the United States in Canada, in response, said: "Mr. Mayor, Ladies and Gentlemen—A few minutes before we came into this room it was intimated to me that there would be a toast to the President of the United States to which I would be expected to respond. I expressed the opinion to the gentleman who conveyed that intimation, that it was an improper time to make speeches, and he replied, "The shorter the better." I shall, therefore, say just as few words as I consistently can in grateful acknowledgment of the toast to the President of the United States. I apprehend there is a sort of double duty about it. In the first place, I have to thank the people of Canada, and particularly the people of Ottawa, on behalf of the President of the United States, for receiving the American Society of Civil Engineers so kindly; and in the second place, as a temporary resident of Canada, I have to congratulate the Society of Civil Engineers upon the heartiness of their reception in Canada. When I first came to Canada I was asked almost every other day what the people of the United States thought of Canada. Well, I think Canadians are finding out pretty well what the people of the United States think of them by these frequent visits of distinguished societies from the United States to Canada. I am very sure, gentlemen, that the people of the United States who visit Canada will carry back with them a very vivid impression of the kindness and hospitality of the people of Canada. I thank you for the compliment you have paid the President of the United States.

The toast to the Governor-General and the Princess Louise having been honored,

The MAYOR.—I have reason to regret that some more eloquent tongue, some more intellectual mind was not chosen on this occasion to propose the important toast that I am about to propose. I feel myself inadequate to the occasion, and for this reason I asked Mr. Bogart to announce to you that we were in a great hurry. The tokens of honor, ladies and gentlemen, the respect with which your profession has been received are proof positive that we are on the march of civilization, that we are making progress. Men are coming to recognize all professions as honorable in proportion as they depend upon the exercise of high human intelligence. We know what you have accomplished on the other side of the border, and you know what we are accomplishing in our younger and less developed country. I can assure you, gentlemen, that Canadians are proud of our civil engineers who are among us, and who are your hosts to-day. We are proud of Mr. Fleming, who, on the Canadian Pacific, and on the Intercolonial, has proved himself a competent and able engineer. We have here, ladies and gentlemen, Mr. Keefer, whose name, like Mr. Francis' name in the United States, is a household word in Canada. We have here Mr. Walter Shanley, and you who know what the Hoosac Tunnel is can form some idea of Mr. Shanley's engineering capacities. We know you to be an able class of engineers. We know you as hydraulic engineers, we know you as mechanical engineers, and as civil engineers, but it has remained for you to learn to-day that we have a class of engineers that I don't think you can surpass, and that is our "Crib Engineers."* Ladies and gentlemen, I have always heard that the associations from the other side of the line, when they come to Canada, always behave very well, and I have always observed that when they get that credit they always have their wives and sisters with them. The present occasion abundantly bears out the rule, and I congratulate you upon it. I can only hope that this visit to the Capital of Canada will be productive of a continuance of that harmony that already exists between the two nations. I can only hope that we may all be able to sing "Yankee Doodle"—though my friend, President Francis, says he does not like it as well as the "Old Suwanee River" song—in the words of somebody whom I once heard sing it:

> "Now let us strive these bonds to knit,
> And in the work be handy,
> That we may blend 'God save the Queen'
> With 'Yankee Doodle Dandy.'"

Now, gentlemen, I only hope those days will come, and that harmony, peace and good-will will always exist between the two nations. We are all jointly interested in solving the problem of national progress on this side of the Atlantic, and I believe that on this side of the Atlantic now

*Referring to the cribs of square timber which had been floated down the slides at the Chaudière Mills.

exists the greatest confederation of freemen that ever existed under the sun. I, therefore, ladies and gentlemen, without any further comment, beg to propose the toast of "The President and members of the American Society of Civil Engineers," coupled with this I will call upon General Ellis and Mr. Bogart to respond.

General T. G. Ellis.—Since you have called upon me to respond for the American Society of Civil Engineers, I will say that when Montreal was proposed last year as the place of meeting for our Convention, it was with a great deal of doubt that I acquiesced in going to a foreign country. I was a little afraid that the invasion of a Society like this into a foreign country might be regarded in a little different light from what we intended. But when we arrived at Montreal and met with such a kind reception, when we were carried around the mountain to see that delightful view, and were received so hospitably by all whom we met, my doubts entirely vanished. I began to feel that we were all Americans; that the people of the United States and the people of Canada were in sympathy with each other; that though they might be under different governments they were really all Americans. We are all on the same side of the water, and we assimilate and associate together as one people. And when I came up here to Ottawa and saw the beautiful scenery along the railroad, and observed the extensive lumber manufacture, I thought then also that we were all Americans. I see here the same spirit of enterprise and development that I see in the United States. And when I visited the Chaudière Mills and witnessed that hydraulic experiment in rafting lumber down the slides, I thought that in some respects, at least, the engineers of Canada were greatly in advance of the engineers of the United States. Previous to seeing that experiment I do not think there was an engineer in our Society who would have volunteered to carry those rafts safely down those rapids, but I think now we could all do it. We have learned something. And, gentlemen, let me say in conclusion that whenever any engineer or any resident of Canada, any person bearing the devices that we see around this hall, any person who calls himself a Canadian, shall come to the United States, we shall receive him with as warm hearts and as open arms as you have received us here to-day.

Mr. J. Bogart then made a few remarks.

The Mayor.—Prior to leaving for Parliament Hill the corporation of Ottawa desires to present to your diffident President and the diffident members of your Association a short address, which I will now read:

Mayor's Office,
Ottawa, June 16, 1881.

To the President and Members of the American Society of Civil Engineers:

Gentlemen,—On behalf of the corporation we welcome you to the Capital of the Dominion, and only regret that the pressure of your en-

gagements precludes the possibility of a more tangible manifestation of regard and appreciation.

The splendid engineering triumphs achieved by you and those you represent throughout the United States; the record of active, indomitable zeal and intellectual exertion, productive of such wonderful progress is stamped upon every page of your country's history, whilst the practical results will ever remain as monuments commemorative of the intelligence and civilization which mark the nineteenth century.

Be assured that we are not unmindful of what Canada owes to those who have set so noble an example in the field of scientific research, and we shall ever retain a kindly and generous sentiment towards the distinguished visitors present in Ottawa to-day.

Signed in behalf of the corporation.

C. H. MACKINTOSH,
Mayor.

W. P. LETT,
City Clerk.

The MAYOR, after reading the address, presented it to Mr. FRANCIS, President of the Society, who said:

On behalf of the American Society of Civil Engineers I beg to present to you their hearty thanks for your hospitable reception. We hope to see any or all of you in the United States.

The company then proceeded to inspect the Parliament buildings and the city water works, after which they re-embarked for Montreal where they arrived shortly after 10 o'clock.

FRIDAY, JUNE 17TH.—The Convention resumed business at 10:30 A. M.

The Chairman suggested the propriety of appointing a committee to draft an address in reply to the address presented to the Society at Ottawa yesterday, and which bore the official seal of the corporation of Ottawa, and also an address in reply to that presented by the Mayor in behalf of the corporation of Montreal.

On motion, the Chairman was requested to appoint a committee for that purpose.

The Secretary read a telegram from Atlanta, Georgia, inviting the Society to take part in the Exposition to be held there during the three last months of the present year.

On motion, the Secretary was instructed to acknowledge the receipt of the telegram and to present the thanks of the Society therefor.

A paper by Ashbel Welch, Vice-President of the Society, subject "Comparative Economy of Light and Heavy Rails," was then read by the author.

A recess was then taken during the business meeting (see page 62).

At the close of the business meeting the session of the Convention

was resumed, and the following Nominating Committee was appointed in accordance with section 24 of the by-laws:

Wm. E. Worthen, of New Nork; John Kennedy, of Montreal, Canada; John MacLeod, of Louisville, Ky.; A. F. Wrotnowski, of New Orleans, La.; M. Lane, of Milwaukee, Wis.

A recess was then taken.

In the afternoon an excursion was taken upon the river in a steamer provided by the Harbor Commissioners. After a sail along the city front, the lower lock of the Lachine Canal was visited and the operation witnessed of putting into position one of the new lock gates of the enlarged canal. The steamer then passed through the canal to the Wellington basin.

A special train upon the Grand Trunk Railway was then taken, and the Victoria Bridge visited and examined Afterward the train took the party to the extensive shops of the Grand Trunk Railway. All the mechanical departments were inspected under the escort of the officers in charge, and at the close of the inspection the library and reading room for the employees were visited. Here a handsome collation was provided, and addresses were made by members of the Society and by officers of the railway. Music was given by a band formed of employees of the railway.

The same train then took the party to the pumping station of the city water works which were examined in company with the engineers in charge of the water service.

In the evening a reception was given at the Windsor Hotel.

SATURDAY, JUNE 18TH.—The Convention reassembled at 10:40 a. m.

The Secretary made announcements.

The following resolution offered by J. J. R. Croes was adopted:—That the thanks of the American Society of Civil Engineers, in Annual Convention assembled, be returned to the several corporations, committees and individuals who have, by their kind feelings, courtesies and liberality, shown their interest in the Society and contributed so largely to the enjoyment of its members on this occasion, and that the Secretary be directed to communicate to each of the same a copy of this resolution.

A paper by Messrs. T. C. Clarke, John Griffin, A. Bonzano and David Reeves (Clarke, Reeves & Co.), subject, "Experiments upon Full Size Phœnix Columns," was read by the Secretary, and discussed by A. Coffin.

A paper by Robert H. Thurston, subject, "On the Strength and Ductility of the Copper-Tin-Zinc Alloys," was, in the absence of the author, read by the Secretary.

A paper on Systems of Sewerage, by R. Hering, was read by the author.

The SECRETARY—I have here several answers to a set of questions on

this subject which a member of the Society, Mr. J. J. R. Croes, prepared some time ago, and sent out to some of the members.

The Secretary then read answers to these questions and discussion on the subject which had been received from Messrs. W. R. Hutton, C. E. Fowler, Eliot C. Clarke, J. F. Flagg, and Louis H. Knapp.

The subject was also discussed by Messrs. C. E. Fowler, A. Merriwether, J. Bogart, T. G. Ellis, A. P. Boller, J. J. R. Croes and P. A. Peterson.

A paper on Weights and Measures, by C. Latimer, was then read by the author, and discussed by Messrs. A. Welch and F. Brooks.

Vice-President WELCH announced, for the President, the following committee upon the subject of Tests of Iron and Steel: T. Egleston, A. P. Boller, T. C. Clarke, F. Collingwood, William Metcalf.

The Chairman announced the following Committee for drafting replies to the addresses of the corporations of Montreal and Ottawa: The President, the Vice-Presidents and Secretary of the Society, and Messrs. Wm. E. Worthen and T. G. Ellis.

The Convention then adjourned.

A large number of the members of the Society, *en route* to the Convention at Montreal, met at Niagara Falls on June 11th, the Saturday preceding the opening session of the Convention. During that day they fully examined the re-enforcement of the anchorage and the new suspended structure of the Niagara Railway Suspension Bridge. They were accompanied by Mr. L. L. Buck, Member A. S. C. E., who was the engineer in charge of that work, and by Mr. W. G. Swan, the superintendent of the bridge.

The roadway Supension Bridge near the Falls, was also visited, and the three recently built suspension bridges on the Canada side connecting the islands above the Falls. These were examined under the escort of Mr. Benjamin Rhodes, the engineer in charge of their construction. The new constructions of the water power company were also inspected. A visit was made to Lewiston, and to the wreck of the old Suspension Bridge near that place.

On Monday morning the party proceeded by the Great Western Railway to Toronto. At that city they were met by W. Gooderham, Jr., Esq., under whose escort a drive was taken through the city, visiting the station of the Toronto & Nipissing Railway, where the successful working of the Haggas Water Elevator for Locomotives was practically exhibited. After a drive through the park, and the grounds of the university, a reception was given to the members of the Society and its guests by Col. C. S. Gzowski, Member A. S. C. E. The party was welcomed by Col. Gzowski and family, and by the Lieutenant-Governor of the Province of Ontario. Short addresses were made on this occasion.

The journey from Toronto to Montreal was made by steamer on Lake Ontario, passing the Thousand Islands and the Rapids of the St. Lawrence, and arriving at Montreal on Tuesday afternoon, June 14th. A delegation of the local committee at Montreal met the steamer early on that day and returned with the party so as to assure every arrangement for their reception at that city.

The programme of the Convention was printed in a handsomely bound pocket-size form, with an appropriately illustrated cover. This printed programme was as follows :

AMERICAN SOCIETY OF CIVIL ENGINEERS.

Thirteenth Annual Convention—Montreal, June 15, 16, 17 and 18, 1881.

The headquarters of the Society during the Convention will be at the Windsor Hotel. The Secretary's office will be in Parlor No. 4.

The meetings of the Convention will be held in the William Molson Hall, McGill University.

Members of the Society and guests of the Convention will please report at the Secretary's office, in the hotel, immediately on arrival.

Special Committees for each day are designated in the programme, and will be known by a tri-color badge.

The Grand Trunk Railway, and the Quebec, Montreal, Ottawa & Occidental Railway, have kindly placed special trains at the disposal of the Convention for the excursions indicated in the programme.

Wednesday, June 15th.—Convention will be called to order at 9:30 A. M.; Hon. J. L. Beaudry (M. L. C.), Mayor of Montreal, will welcome the Society on behalf of the citizens of Montreal; the Board of Trade and Corn Exchange will assist in the reception; Principal Dawson (McGill University), C. M. G., will deliver an address.

Adjournment.—Lunch. In the afternoon, leaving the hotel at 1.45 o'clock, an excursion in carriages will be made to the Mountain Park, and Terrace Bank, the residence of Mrs. Redpath, who has kindly invited the Society to a garden party, from 4 to 6.30 P. M. At 8 P. M. the regular meeting will be held, to which the public are invited. The President of the Society, James B. Francis, Esq., will deliver the Annual Address.

Special Committee.—*C. S. Gzowski, *G. D. Ansley, Henry T. Bovey, F. R. Redpath, *R. J. Brough.

Thursday, June 16th.—Excursion to Ottawa. Leave the Mile End Station of the Q. M. O. & O. R. R. at 9.20 A. M., arriving at Ottawa at 1 P. M.; visit the Chaudière Falls, Water Works and Timber Slides; opportunity will be given to descend the latter upon cribs; dinner; visit the Parliament Buildings, Rideau Canal, etc., returning from Ottawa at 6.30 P. M., and reaching Montreal at 10 P. M.

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*Are Canadian members of the Society.

Special Committee.—W. Shanly, *Samuel Keefer, *P. A. Peterson, *Sandford Fleming, *W. G. Thompson.

Friday, June 17th.—Session, 9–12. In the afternoon, leave the hotel at 1.30 and drive to the Island Wharf for an excursion upon the river in a steamer which has been kindly placed at the disposal of the Convention by the Harbor Commissioners. The boat will return at 2.30 P.M., when those who were unable to be present for the first trip may be taken on board at the lower lock of the Lachine Canal, and then pass up the canal to the Wellington Bridge Basin; visit the Victoria Bridge, Grand Trunk Work-shops and the City Water Works; return to Bonaventure Station at 6 o'clock.

Special Committee.—J. Page, *J. Kennedy, *E. P. Hannaford, H. Wallis, L. Lesage, E. H. Parent.

Society reception at the Windsor at 7.30 P. M.

Saturday, June 18th.—Session, 9–12.

List of illustrations: page 2—Boat approaching Rapids; page 4—Victoria Bridge; page 6—Port of Montreal (Summer); page 8—Port of Montreal (Winter); page 10—Ice Railway; page 12—Lock, Lachine Canal; page 14—Parliament Buildings, Ottawa; page 16—Timber Slide, Ottawa; page 18—Canadian Winter and Summer Scenery.

The City of Montreal.

On the second of October, 1535, Jacques Cartier landed about six miles below the current St. Mary, and was conducted with certain ceremonies into Hochelaga, now the eastern suburb of the City of Montreal. After having ascended the mountain which forms the beautiful background to the present city, Cartier gave it the name of "Mont Royal" in honor of the King of France, and, on his return to his native country, recommended it as a favorable site for a settlement.

The actual foundation of Montreal may be dated from the 17th of May, 1642, when Maisonneuve landed. His followers forthwith fell on their knees, and all joined their voices in songs of thanksgiving; an altar was erected, mass was celebrated, and the officiating priest, under the shadow of Mount Royal, thus addressed the pioneers of the present city: "You are a grain of mustard seed which shall rise and grow until its branches overshadow the land." In the evening, Maisonneuve and his companions pitched their tents, lighted their fires, stationed their guards, and lay down to rest. Such was the birth-night of Montreal.

Exactly one century later, the site selected for the city was consecrated with due solemnities, commended to the "Queen of the Angels," and called "Ville-Marie," a name which it retained for a long period. In 1760, it was taken by the English. In 1764, the first newspaper in Canada was published in Montreal. In 1809, the first steam vessel made a trip from Montreal to Quebec; she had berths for 20 passengers. In 1836, the first railway in Canada was opened from St. Lambert's, oppo-

site Montreal, to St. Johns, and in 1847, the Montreal & Lachine Railway, the first railway on the north side of the St. Lawrence, was put in operation. In June, 1853, the Grand Trunk Railway was opened to Portland. In 1801, the first water works were erected in Montreal by a company. The water was supplied by gravitation through wooden pipes. In 1819, they were replaced by 4-inch iron pipes. In 1832, the works passed into the hands of another company, and water was pumped from the river in front of the city, into a reservoir on Notre Dame street. In 1849, a new reservoir was built 25 feet higher in another part of the city, which contained 208 000 cubic feet of water. Referring to this reservoir, a city newspaper remarks at the time: "The great altitude of this immense cistern will enable the committee to supply water to the upper stories of almost every house in town." In 1852, the plans for the present mode of supply by water power were submitted and adopted. The works have been enlarged with the growth of the city, and the pumping capacity is now 24 million imperial gallons per 24 hours—the daily consumption averages 10 millions, or 74 gallons per head; there are 133 miles of mains, 25 752 houses supplied, and 866 hydrants. The annual revenue from the water supply is $366 475.

The sewerage has a total length of 83½ miles.

The area of Mount Royal Park is 430 acres.

The population of Montreal is about 150 000, occupying an area of 3 630 acres within the corporate limits. Length of streets, 105 miles. Assessed value of real estate, $66 160 613, of which the property of the Government, churches and educational establishments, to the value of $13 964 050, is exempt from taxation. The total annual revenue of the city from all sources is $1 519 817. The rate of assessment is one per cent. on real estate, and for business taxes seven and a half per cent. on rental of premises.

VICTORIA BRIDGE.

First stone, No. 1 Pier, laid 20th July, 1854.
First passenger train passed 17th December, 1859.
Total length of bridge, 9 184 feet lineal.
No. of spans, 25; 24 of 242 feet; one of 330 feet.
Height from surface of water to underside of centre tube, 60 feet.
Height from bed of river to top of centre tube, 108 feet.
Greatest depth of water, 22 feet.
General rapidity of current, 7 miles an hour.
Cubic feet of masonry, 3 000 000.
Cubic feet of timber in temporary work, 2 250 000.
Cubic yards of clay used in puddling dams, 146 000.
Tons of iron in tubes, say 8 250.
Number of rivets, 2 500 000.
Acres of painting on tubes, one coat, 30; or for the four coats, 120 acres.

Force employed in construction during summer of 1858, the working season extending from the middle of May to the middle of November :

Steamboats, 6 ; horse power, 450 ; barges, 72.....		12 000 tons.
Manned by.....	500 sailors.	
In stone quarries.....	450 men.	
On works, artisans, etc.....	2 090 "	
Total.....	3 040 "	
Horses, 142 ; locomotives, 4.		
Total cost.....		$6 300 000

Test of Tubes.

A train of platform cars, 520 feet in length, and drawn by three engines, extending over two tubes, was loaded almost to the breaking limit of the cars, with large blocks of stones.

When the train covered the first tube, the deflection in the centre amounted to ⅜ of an inch, and the adjoining one to which it was coupled, was lifted in the middle ⅜ of an inch. The load then being placed over both tubes, the deflection was the same in each, or ¾ of an inch in the middle, and on being entirely removed, both sides assumed their original level.

The large centre span, entirely disconnected from the other tubes, on being covered with the load throughout its entire length, deflected in the centre 1⅞ inches, and came back to its previous level on the load being removed.

CANADIAN WATERWAYS.

The Valley of the St. Lawrence.

This great basin covers an area of 400 000 square miles, exclusive of lakes and rivers, which, including the gulf, have an area of 130 000 square miles. About 70 000 square miles belong to the United States, leaving 330 000 to Canada, 280 000 of which is upon the north side of the St. Lawrence, embracing not only some of the finest agricultural and timbered lands, but also the great northern hill region, or Laurentian system, the oldest known rock formation of the globe, rich in iron, copper, lead, gold, silver, phosphates, plumbago, mica, barytes, asbestos, etc.

The great lakes, the largest and purest body of fresh water in the world, have an area of 90 000 square miles, with dimensions, depths, and elevations above tide, as follows :

	Length.	Breadth.	Depth.	Elevation above Sea.	Area in Sq. Miles.
	Miles.	Miles.	Feet.	Feet.	
Superior	460	170	800	600	31 500
Michigan	330	90	700	576	22 000
Huron	260	110	700	574	21 000
Erie	250	60	200	565	9 000
Ontario	180	60	600	235	6 400

The calculated discharge from the upper lakes by the Niagara river is over twenty millions of cubic feet per minute, and as this does not represent more than half the rain-fall upon the drainage area of their basins, it is assumed that the evaporation is equivalent to the volume discharged by the outlets to the sea.

The Lakes of the Prairie Region.

The lake system of the prairie region is low in altitude, covers an area of 13 000 square miles, and is as follows:

Winnipeg	area 8 500	square miles	above sea	650	feet.
Manitoba	" 1 900	"	"	670	"
Winnepegosis	" 1 936	"	"	692	"
Cedar Lake	" 312	"	"	688	"
Dauphin Lake	" 170	"	"	700	"

The River System.

The four principal rivers on the eastern, northern and western watersheds of Canada are:

St. Lawrence,	length, 1 500	miles	drainage area,	330 000	square miles.
Saskatchewan and Nelson,	" 1 500	"	"	450 000	"
Mackenzie,	" 1 200	"	"	440 000	"
Fraser,	" 450	"	"	30 000	"

The Ottawa, a branch of the St. Lawrence, is nearly 600 miles in length.

Canals of Canada.

The canals of Canada are more remarkable for their breadth than for their length. The total length of canal and river improvement embraces about 250 miles upon the St. Lawrence, Ottawa, Rideau, and Richelieu Rivers, exclusive of the ship channel improvement below Montreal. The existing St. Lawrence canals have a bottom width of 80 to 100 feet, surface width 120 to 150 feet, with 10 feet depth of water, the locks being 200 feet long by 45 to 50 feet wide in chamber. The locks of the Wel-

land Canal are 150 feet in length by 26 feet in width of chamber, depth of water, 10 feet. Both these works are now in course of enlargement upon a uniform scale of locks 270 feet long by 45 feet wide, in the chamber, with a depth for vessels drawing 14 feet. The Welland will be opened with enlarged locks, but only 12 feet draught of water, next month.

From the Atlantic entrance of the Straits of Belle Isle *via* the River St. Lawrence and lakes, to Fond du Lac (head of Lake Superior), the distance is 2384 miles. On this route there are the Lachine, Beauharnois, Cornwall, Farron's Point, Rapide Plàt, Galops and Welland Canal, the aggregate length of which is 70¾ miles, and the total lockage 536½ feet through 54 locks up to Lake Erie; also the Sault Ste. Marie Canal, 1 1/10 miles in length, with 18 feet lockage, uniting Lake Huron and Lake Superior.

The progress of improvements on the St. Lawrence is shown as follows: For the

LACHINE CANAL.

Boat Canal.—Formed last century *via* River St. Pierre to Montreal. Depth of water, 2½ feet.

Barge Canal.—Commenced in 1821, and completed in 1825. Cost, $438 404. Length, 8¼ miles; lockage, 44½ feet; bottom width, 28 feet, at water surface, 48 feet; 7 locks, 100 feet long, 20 feet wide, with 4½ feet depth of water on sills.

Ship Canal.—Commenced in 1843, and completed in 1849. Cost, $2 149 128. Length, 8½ miles; lockage, 44½ feet; bottom width, 80 feet, at water surface, 120 feet; 5 locks, 200 feet long, 45 feet wide, with 9 feet of water on sills.

ENLARGED SHIP CANAL.

Commenced in 1875. Probable cost, $6 500 000. Length, 8½ miles; lockage, 45 feet. Summit level, Lachine to Côte St. Paul, 5¾ miles long, mean width, 150 feet. Reaches, downward to Montreal, 3 miles; mean width, 200 feet; intended depth, 15 feet; 5 locks, each 270 feet long, 45 feet wide in the chamber—three of which have 14 feet depth of water on the sills, and two at the lower entrance, together with adjoining basins between Grand Trunk Railway at Point St. Charles and Harbor of Montreal, are adapted to vessels of 18 feet draught.

Five swing bridges on piers of cut stone, having an opening 46 feet wide on each side of centre for passage of vessels, and a waterway, 32 feet wide, on both sides of canal.

Lock walls throughout, also the basin and dock walls for one mile above lower terminus, are of cut stone laid in hydraulic cement mortar. Thence upwards for half-a-mile the dock walls are of random coursed masonry laid in cement mortar. Between the third and fourth locks, a distance of 1½ miles, the side walls are of random coursed stone laid at

right angles to a face inclination of two-thirds to one ; summit level, for 4½ miles, faced on both sides with masonry.

Entrance to Lake St. Louis formed of crib-work, on which is to be built a superstructure of masonry.

Dimensions of enlarged canals on St. Lawrence to be uniform from Montreal to Lake Erie.

Total cost of Canadian canals, when completed, will be about $55 000 000, of which about $33 000 000 is the cost of enlargement of St. Lawrence, Welland, and Ottawa Canals, $22 000 000 having been expended on canals previous to Confederation in 1867.

Dredging Ship Channel below Montreal.

After an abortive attempt by the Government to cut a new channel through the flats of Lake St. Peter, between the years 1844–1847, the work was undertaken in 1851 by the Harbor Commissioners of Montreal, Hon. John Young, Chairman, in the natural channel. In 1866, the depth of 20 feet was obtained where before was only 11 feet at low water. In 1875, dredging was resumed for draught of 25 feet depth at low water, which result will be attained next year. The present depth is for 22 feet draught of water.

The points of dredging extend over about one hundred miles of river, commencing 50 miles above Quebec, and form, in their aggregate length, over 30 miles of deepened channel, of which more than one-half is at one point—in Lake St. Peter. The dredging embraces all varieties from the silt of Lake St. Peter, through boulders and hard-pan up to shale rock at Cap La Roche. About 6½ millions cubic yards have been dredged since 1874 out of the estimated 8 000 000 yards to be removed for the 25 feet channel. Last year 806 000 yards were removed from Lake St. Peter at a cost of $31 600, or an average of $3\frac{9}{10}\frac{3}{0}$ cents per cubic yard—covering all charges except interest and depreciation. The minimum breadth of channel is 300 feet, in which there is now at low water a greater depth below the original bottom than above the same level; in other words, when completed, $\frac{1}{2}\frac{1}{5}$ths of the depth of channel through Lake St. Peter will be artificial.

The effect of this work on the Port of Montreal is shown by the following figures :

Years.	Sea-going Vessels in Port.	Total Tonnage.	Value of Merchandise Exported.	Value of Merchandise Imported.	Customs Duties Collected.
1850	211	46 156	$1 744 772 00	$7 714 780 00	$1 009 256 80
1880	710	628 271	30 224 904 00	37 103 869 00	5 232 783 00

The number of vessels in 1880 included 354 steamships, their aggregate tonnage being ten times greater than that of all the vessels in 1850.

	1850.		1880.	
	Receipts.	Shipments.	Receipts.	Shipments.
Wheat, bushels	845 277	71 359	9 637 124	9 084 266
Indian Corn, bushels	51 965	5 719	7 772 549	7 622 161
Peas, "	21 256	98 006	2 617 656	3 081 674
Oats, "	3 677	1 061	1 191 531	1 853 829
Barley, "	512	350	357 176	293 023
Rye, "	.....	.....	443 528	452 847
Flour, barrels	483 603	182 988	735 596	739 007

There are no figures at hand to show the shipments (if any) of butter and cheese from Montreal in 1850. Some idea may be formed of the increase in the trade in these articles by comparing the following figures relating to the years 1870 and 1880 :

Shipments in 1870.		*Shipments in* 1880.	
Butter..7 763 976 lbs..	value $1 507 591	Butter..13 983 840 lbs..	value $2 882 360
Cheese. 5 633 883 " ..	" 801 170	Cheese..34 776 180 " ..	" 3 995 220

Canadian Railways.

There are over 7 000 miles of track laid, and another thousand under construction, besides over 2 000 miles of the Canadian Pacific Railway, under contract, on which construction has not yet been commenced.

The total Canadian mileage is only exceeded by that of the United States, Germany, Great Britain, Russia and France. In mileage, in proportion to population, Canada equals the United States, which in this respect surpasses every European country.

Of the $100 000 000 of Canadian capital invested in railways, over $99 000 000 are Government and municipal contributions, in the proportions of $74 000 000 by the Dominion Government, $27 000 000 by the Provincial Governments, and $8 000 000 by municipalities. Over $100 000 000 of share capital is held in England, and preference shares and bonds, in nearly equal proportions—chiefly held in England—supply the remainder, about $150 000 000, of the total cost.

Canadian Pacific Railway.

Length from Lake Nipissing to Burrard Inlet on Pacific coast, about 2 600 miles. From the Lake Nipissing terminus to Montreal, the dis-

tance is 340 miles. The section between Lake Superior and Red River, 406 miles, will be completed next year. 127 miles at Pacific coast, through the cañons of the Fraser, has been let for $9 000 000, and is to be completed in 1885. The whole line is to be completed in 1891. It will open a country which contains, between the Red River and the Rocky Mountains, over 250 000 000 acres of arable and grazing lands—more than half of which is arable.

The proportion of those undeveloped territories to that of the settled Provinces, is shown in the following :

AREA OF THE DOMINION OF CANADA.

PROVINCES.	SQUARE MILES.
Ontario	103 460
Quebec	193 355
New Brunswick	27 322
Nova Scotia	21 731
Prince Edward Island	2 133
Manitoba	153 250
British Columbia, including Vancouver and other Islands	390 344
North-West Territory	1 891 400
Keewatin District	309 077
Islands in the Arctic Ocean	311 700
Islands in the Hudson's Bay	23 400
	3 427 172

Statement reconstructed (to date) of areas of the several Territories, Provinces and Districts comprised in the Dominion of Canada.

J. S. DENNIS,
D. M. Int.

OTTAWA, June 7, 1881.
Certified, A. R.

On Thursday, June 16th, when the special train approached Ottawa, a Reception Committee welcomed the Society, and distributed a special programme for the day, which was also handsomely printed, bound in pocket form, and which read as follows:

PROGRAMME FOR THE RECEPTION OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS AT OTTAWA, JUNE 16, 1881.

PROGRAMME.

The visitors will arrive at the station of the Q. M. O. & O. R. R. at 1 o'clock P. M. Conveyances will take them *via* Queen and Bridge streets to near the Saw Mills at the Chaudière Falls. After inspecting the

Falls, Mills, etc., the party will drive across the Suspension Bridge, as far as the Sash Factory of Mr. E. B. Eddy, in Hull. Any of the party desirous of running the slides will be taken to near Mr. Rochester's Saw Mill, Queen street, where the cribs will be in readiness, and any of the visitors not desirous of descending the slides will be driven down Middle street, to near Messrs. Bronsons' Mills, where they can see the party descend the Slides. The entire party will thereafter assemble on Middle street, near Bronsons' Mills, and be driven to the Grand Union Hotel, where luncheon will be served at three o'clock, sharp. At four o'clock the party will visit the Parliament Buildings, Library and Grounds, and any desirous of visiting the residence of H. E. the Governor General, will be driven to Rideau Hall, on making application to the Secretary. The party will assemble at the Grand Union Hotel at 5:30, sharp, when they will be driven to inspect the Water Works, near Pooley's Bridge, and from thence to the Railway Station.

The following gentlemen, subscribers, have been constituted the Reception Committee, and will be glad to give all the assistance and information required to further the enjoyment of those now visiting the Capital of the Dominion: Allan Gilmour, Esq., Ottawa; Bronsons & Weston, lumber manufacturers; Perley & Pattee, lumber manufacturers; J. R. Booth, Esq., lumber merchant; John Rochester, Esq ,M. P., lumber merchant; Levi Young, Esq., lumber merchant; E. B. Eddy, Esq., lumber merchant; Gilmour & Co., lumber merchants; David Moore, Esq., lumber merchant; Thos. McKay & Co., flour merchants; Samuel Keefer, Esq., C. E.; T. Trudeau, Esq., C. E., Deputy Minister Railways and Canals; John Page, Esq., C. E., Chief Engineer Canals; G. F. Baillargé, Esq., C. E., Dep. Minister Public Works; F. N. Gise borne, Esq., Supt. of Telegraph and Signal Service; Col. Brunel, C. E., Commissioner of Inland Revenue; C. Blackwell, Esq., C. E., Dept. Railways and Canals; Sandford Fleming, Esq., C. E., C. M. G.; Thos. C. Keefer, Esq., C. E., C. M. G.; Walter Shanly, Esq., C. E.; Frank Shanly, Esq., C. E.; Thos. S. Scott, Esq., Chief Architect Public Works Dept.; H. F. Perley, Esq., Chief Engineer Public Works Dept.; Collingwood Schreiber, Esq., Chief Engineer Canadian Pacific; W. P. Anderson, Esq., Dept. Marine and Fisheries; Col. Dennis, Dep. Minister of Interior; W. B. Smellie, Esq., C. E., Canadian Pacific Railway; F. A. Wise, Esq., C. E., Supt. Rideau Canal; C. H. Mackintosh, Esq., Mayor of Ottawa; Lindsay Russell, Esq., Surveyor General; Leonard G. Bell, Esq., C. E.,; J. G. Macklin, Esq., C. E.; William Kingsford, Esq., C. E.; R. C. Douglass, Esq., C. E., Dept. Railways and Canals; J. Tomlinson, Esq., C. E., Dept. Railways and Canals; T. Ridout, Esq., C. E., Dept. Railways and Canals; G. P. Brophy, Esq., C. E., Ottawa River Works; Robert Surtees, Esq., City Engineer, Ottawa; James Goodwin, Esq., Ottawa; William Davis, Esq., Ottawa; Francis Clemow, Esq., Ottawa.

The following gentlemen, members of the Executive Committee, will attend personally to the requirements of the visitors: W. B. Smellie, C. E., Chairman of Committee ; C. H. Mackintosh, Esq., Mayor of Ottawa; George P. Brophy, C. E. ; F. A. Wise, C. E. ; H. F. Perley, C. E. ; J. G. Macklin, C. E. ; and Robert Surtees, City Engineer, Secretary.

The following is a brief sketch of the principal points of attraction in the vicinity of the

City of Ottawa.

In 1854, the population of Bytown—now Ottawa—was 10 000, and from that time its progress has been uninterrupted. The great fire of 1870 was the means of maturing a scheme which has resulted in the present water works system.

Her Most Gracious Majesty Queen Victoria decided upon the present location for the Parliament Buildings, and they were commenced in December, 1859.

Among the improvements effected since Confederation at the expense of the city alone may be mentioned :

Five new Market Buildings, costing	$90 000
Dufferin Bridge and improvement to Sappers' Bridge	90 000
Pooley's Bridge at the Chaudière	18 000
Bridges across Rideau River and Canal	9 000
New Iron Bridge across Slide Channel	45 000
Main drainage	295 000
New City Hall	90 000
Registry Office	12 000
Water Works	1 014 000
Collegiate Institute	60 000
Central School Buildings	42 000
Fire Stations	5 000
Making an aggregate expenditure of	$1 770 000

in less than twelve years for city public improvements alone.

The population at present is over 26 000.

Rideau Canal.

This canal was commenced by Colonel By, R. E., in 1826, and consisted in utilizing two rapid and obstructed streams—the Rideau from Ottawa and the Cataraqui from Kingston into one continuous navigable channel. This object was accomplished by the construction of 47 locks, 24 dams, and 24 waste and regulating weirs. Of these locks 33 ascend from Ottawa and 14 descend towards Kingston, embracing a total lockage of 446¼ feet, of which proceeding southward there is a rise of 282¼ feet and 164 feet fall. The locks are constructed of cut stone masonry, their dimensions over all being 134 feet, or 110 feet clear by 33 feet in

breadth, with a navigable depth throughout of 5½ feet. The length of the canal from Ottawa to Kingston on Lake Ontaria, is 126¼ miles. The works were constructed by the Imperial Government, and originally cost about $4 000 000. This canal is now under the control of the Dominion Government, and Mr. F. A. Wise, Superintending Engineer.

The Parliament Buildings.

These buildings are generally known as the Eastern, Western and Central Blocks. The latter contains the Legislative Chambers and Parliamentary offices and Library—the two former the various departments of the Government. The three blocks form as many sides of a square, which is open to Wellington street on the south. The grounds, which were naturally very rough, have been laid out in walks and drives. A noteworthy adjunct to the grounds and surroundings is the "Lovers' Walk," a delightful winding path, which threads the edge of the precipice surrounding the grounds on the river side at an approximate distance of half way between its summit and the Ottawa river. The general style of architecture of the buildings is a modified twelfth century Gothic. The principal material used in the construction is a hard cream colored sandstone from the adjoining Township of Nepean. The dressings, stairs, gablets, pinnacles, &c., are of Ohio freestone, whilst a pleasing variety is given to the whole by the relieving arches of red Potsdam sandstone over the window and door openings. The roofs are covered with slate of a dark color, with bands of a brighter hue, obtained from the State of Vermont. The marble was obtained from Arnprior, and other localities in the Ottawa Valley, and all the timber used in the construction, except the oak, came from the Valley of the Ottawa.

The basement floors of the central building are 160 feet above the low water level of the Ottawa river, the Eastern and Western Blocks being respectively 135¼ and 142½ feet above same level. The central building has a frontage of 472 lin. feet, 3 stories in height. The central tower has an altitude of 220 feet, and a superficial area of 30 feet square.

The superficial area covered by the buildings is as follows: Central building, 82 886 sup. feet; Eastern Block, 41 840 sup. feet; Western Block, 50 176 sup. feet; or a total area of near 175 000 sup. feet, or 4 acres.

The Library is connected with the central building. The ground plan is of circular shape in the centre, inscribed by a polygon lean to of sixteen sides; at each of the sixteen angles are buttresses carried up solid to a point above the top of the lean to, serving as bases for the flying buttresses, which receive the thrust of the main vault. The general exterior view presents the form of a cone; the roof is groined, with ribs of stone filled in with solid masonry, and supported by marble

columns, resting on corbels of the same material. The groin is 42 feet in height, and the springing line 40 feet over the floor. In the centre of the vaulted space is an opening of 30 feet in diameter ; the main ribs being so arranged as to touch its circumference, and continue in a vertical plane between the springers ; above this opening is a groined lantern 42 feet high, the top of which is 124 feet above the floor level.

The total expenditure on these buildings and grounds is over five million dollars.

Rideau Hall.

The official residence of His Excellency the Governor General is situated in the Village of New Edinburgh, a suburb of Ottawa. It was built as a private residence by the late Hon. Thomas McKay, a man early identified with the chief interests of Bytown. About 87 acres of land are attached, and the amount expended for this property by the Dominion Government is over $300 000. The finest cricket ground in the Dominion is located on this domain.

Suspension Bridge (Chaudière).

On the Union of the Provinces in 1841 steps were taken to renew the inter-provincial communication, and in 1842 the present structure was commenced, the engineer being Mr. Samuel Keefer. The construction occupied over two years. The bridge is 256 feet span ; width of roadway 23 feet 6 inches.

The City Public Buildings

Include the City Hall, which is of the modern style of architecture, with a leaning to the French style, and constructed of massive dressed limestone blocks, with cut stone trimmings. It is centrally and conveniently situated on Elgin street ; at its northwest corner is a tower rising 175 feet above the pavement, used for the fire alarm offices ; the internal arrangements are most commodious and complete. It contains the offices of the several officials and a public council hall, committee rooms, etc., with all desirable modern appliances. The total cost was over $90 000.

The markets include the old and new By Ward Market, the Wellington Ward Market, and two subsidiary markets on Anglesea and Cathcart squares.

The City Registry Office, on Nicholas street, a substantial stone building on the general Government plan, cost $12 000.

The County Buildings comprise the Court House, Jail and Registry Office buildings. They are surrounded by a massive cut stone wall, surmounted by handsome wrought-iron cresting. They are of a very substantial character.

The Public School Buildings are of substantial character, and cost as follows :

	Land.	Building.
Victoria Ward (Primary)	$5 050	$10 000
Wellington Ward (Central)	6 780	24 000
" " (Primary)	5 460	4 500
St. George's Ward (Primary)	2 400	10 000
By Ward (Central)	2 100	10 000
" (Primary)	600	3 500
Ottawa Ward (Primary)	600	2 000

Or a total of nearly $90 000 expenditure on public school buildings within ten years.

Churches.—There are 24 Churches in Ottawa, as follows : 1 Baptist, 1 Congregational, 1 German Lutheran, 5 Episcopal, 5 Methodist, 5 Presbyterian, and 6 Roman Catholic. Most of these are very fine edifices, while some of them are exceptionally so, particularly the Cathedral, St. Patrick's, St. Andrew's, Christ's Church, Knox Church, the Baptist, and Dominion and Episcopal Methodist. Christ Church cost $45 000 ; Dominion Methodist, $50 000 ; St. Andrew's, $60 000 ; Knox's Church, $52 000 ; St. Patrick's, $40 000 ; Baptist, $30 000.

Sewerage.

The principal outfall sewer commences at the west end of the city. It is of egg shape pattern, 3 ft. 9 in. by 3 ft. ; brick ; runs easterly through earth and rock alternately for 1 119 yards, at which point it increases in size to 4 ft. 3 in. by 3 ft. 4 in. in a distance of 582 lin. yards, passing under the Rideau Canal to Rideau street, at which point it is again enlarged to 6 ft. 6 in. by 4 ft. 4 in. in brick and stone, passing through earth and rock excavation a distance of 2 411 yards, where it discharges into the Ottawa River near the Rideau Falls. The average depth is about 20 feet, the grades varying from ·15 to 1·5 per 100, except at the discharge, where the grade is 30 in 100. The Chaudière outfall sewer is egg shape pattern, 4 ft. by 2 ft. 8 in., 870 yards in length through solid rock ; average depth, 16 feet. The main sewers commenced in 1874 and completed in 1877, at a cost of $395 000.

Streets.

On the east side of Canal the total length of streets is 31 miles, of which 8¼ miles are either paved or macadamized. On the west side of the Canal there are 30 miles of streets, of which 24 miles are improved, and 7½ miles paved or macadamized.

Water Works.

The supply is a water power-pumping one, under the "direct" system, without stand-pipe or reservoir. It differs from the Holly

system of the United States in that the same machinery is employed for fire as well as for ordinary purposes; the greater delivery required for fires being effected by an increase of speed, or of the number of pumps, or of both, without the necessity of exceeding the ordinary working speed of reciprocal pumps. The works will be best described from the source of supply to the points of delivery under the following heads of—

1st. The Source of Supply.

The water is obtained from the Ottawa River, above the Chaudière Falls, at a point where there is a strong current flowing over a rocky bed. The river for more than one hundred miles above the city is a succession of large deep lakes, forming magnificent natural reservoirs, from which the water is decanted over rocky chutes until it reaches the city in the condition of lake water ærated by the rapids above. The difference between Ottawa and St. Lawrence water as to purity, apart from color, may be inferred from the fact that a single drop of coloring matter will tinge a quantity of water in which a teaspoonful of salt may be dissolved without detection by the eye.

2d. The Water Power.

The Falls of the Chaudière range from 25 feet at high to 35 feet at low water, the difference being due to the fact of a rise of two feet below to one foot above the Falls during freshets. The wide expanse of Deschênes Lake, into which no tributaries of importance are discharged, prevents a rapid rise above Ottawa, while below, the comparatively narrow and shallow reach between Ottawa and Greenville, receives some half dozen important tributaries, sending up the flood level of this portion of the river fully 20 feet above low water mark.

3d. The Aqueduct.

A canal 2 500 feet in length has been cut through the solid rock, 20 feet wide, with perpendicular sides, to a depth of about 13 feet below low water of the head level. The entrance is formed by two lines of crib work, each 20 feet wide and about 200 feet long, placed 60 feet apart, boomed across at the head, and provided with stop logs, and divided by a central pier containing a well, fitted with screens, from which the pure water supply-pipe for the pump is fed.

4th. Pure Water Pipe.

A trench about three feet in width and one foot in depth is excavated in the bottom of the aqueduct, in the bottom of which trench, at intervals of twelve feet, iron bolts are imbedded in the rock, for the purpose of anchoring the clean water from the river, because the aqueduct at present receives such local drainage as may penetrate through the rock in banks above it.

The clean water pipe is 30 inches diameter inside, and is formed of pine staves 2 inches thick, hooped every 4 feet with 3 in. by ⅜ in. iron, (except for the anchorage, where the iron for the hoops is 3 inches by ½ inches thick), open at the bottom, and secured with ¾ inch bolts through the eyes of the anchors. The anchor bolts are 1 inch diameter, with strong head, containing the eye, sharpened at the points, let 18 inches into the rock, and secured by first dropping a soft pine tree nail, about ¼ of an inch less in diameter than the drill hole, into the latter, and then driving the eye-bolt through the wood to its position. Each bolt was subjected to a lifting strain of 2½ tons after being driven, but none could be removed. The strain was increased in one case to test the resistance, but the bolt broke without drawing. The lower end of this pipe leaves the bottom of the aqueduct about 70 feet above the forebays, passes under the retaining walls, and goes to the pipe vault in rear of the pumps, this section, about 100 feet in length, is cast-iron, and the portion within the wheel-house is provided with valves between each set of pumps, and is connected (below the pumps) with a 24 inch pipe leading from the aqueduct in front of the wheel-house. The pumps must have water, and if from any cause the supply from the clean water pipe should be interrupted, aqueduct water can be drawn upon.

5TH. PUMPING MACHINERY.

This consists of three distinct sets, each capable of delivering over 3 000 000 gallons in 24 hours, under a pressure of 150 lbs. at the pumps. Each set is capable of affording a supply for domestic purposes to double the population now receiving it. This large provision of pumping power is necessary in the absence of a high level storage and distributing reservoir, as well as for the requirements of a large fire, to which Ottawa, by reason of its extensive lumber yards and many wooden buildings, is peculiarly exposed. The demands of a great fire being measured by the delivery of a given quantity in a given time under the required pressure, can be more readily and safely met by large pumps moving slowly than by smaller ones at a higher velocity, as in the "Holly" system. Two sets are sufficient for any emergency; and with three sets, two can always be ready for the fire alarm while the remaining one is being overhauled. The wheel-house is the reservoir of the Ottawa Water Works, and it is therefore of the first importance that it should be capable of meeting any and every demand upon it; with water power this can be done in the most perfect manner, for, unlike steam, here all the required power is held in reserve without extra cost. The wheels are Leffell's double turbine, 61 inches in diameter, seated at the level of the bottom of the aqueduct, having their discharges about 12 feet below low water level of forebays, and more than 20 feet below water level of the Ottawa river below the Chaudière Falls.

The "steps" are, therefore, always accessible during the highest known floods. To utilize the whole fall at all times, wrought-iron draft tubes, 5½ feet diameter, air tight, extend from the bottom of the wheels to a depth of 14 feet, giving a total available head and fall at low water of 25 feet, with a clearance of 5 feet depth in tail race below the bottom of the draft tubes. The wheels are worked by water pressure from the mains, acting on a piston connected by each, and pinion with the gate spindle controlled by a small globe or "thumb" valve. Pumps—The pumps are in sets of three, driven by one water wheel, and are cast-iron chests, having a suction chamber below and a delivery one above the pump barrels. The valves connecting each chamber consist of two rows, four in each, of rubber discs 9 inches in diameter, and 1⅜ inches thick, working on a centre spindle, with brass seats and springs. The plungers are 19 inches diameter, with a stroke of 3 feet 6 inches, cast hollow, to "float" as much as possible, and thus reduce the weight on their horizontal bearings. The pump chests are connected with the pedestals of the crank-shaft by strong distance girders, bearing against horizontal thrust upon the foundations. Each set of machinery, making 17 revolutions of crank-shaft per minute, will pump, allowing for loss, a little over 3 000 000 imperial gallons per 24 hours, so that the diurnal capacity of each pump at safe limits of speed may be called 1 000 000 of imperial gallons. Each set is sufficient for the domestic wants of 50 000 people, so that without further outlay here or increased cost of working expenses, a population of 100 000 can be served with one complete set in reserve. The whole machinery occupies a floor space of about 48 feet square, covered by a fire-proof ceiling of iron girders, supporting "Dennet" arches of brick overlaid with sand.

A fire-alarm gong is placed in the machinery room. When an alarm is struck, the pressure, which is ordinarily about 85 lbs. at the pumps, is at once raised to 110 lbs.

Height of Fountain Jet at Pump House, from trignometrical measurement:

2¾ nozzle,	90 lbs.	pressure.....	192 lin. feet.
"	100 "	"	209 "
"	120 "	"	242 "

The cost of the whole system was as follows:

Water power, including wheel-house and foundations, aqueduct, and all structures connected therewith..	$215 000
Pumping machinery, 3 sets.....	90 000
Distribution, 43 miles, including culverts.....	490 000
Fire-alarm.....	7 000
Engineering.....	40 000
Financial, land and general charges.....	172 000
	$1 014 000

The works were constructed under a Board of Water Commissioners, with Mr. Thomas C. Keefer, Chief Engineer, but they have for the past two years been under the management of the Corporation of the City of Ottawa and their officers.

River Ottawa.

The remotest sources of the Ottawa lie to the southeast of Hudson's Bay, near the 49th parallel of N. latitude. The upper portion descends from the northeast towards the southwest towards Lake Temiscamingue, a distance of about 300 miles; then suddenly turning towards the southeast, and following this general direction for about 400 miles, it discharges into the St. Lawrence at the head and foot of the island of Montreal.

Its total length is about 700 miles from its principal outlet to the village of Ste. Anne, or head of the island, and it drains an area of about 57 800 square miles. Its most important tributaries are the Rivière du Nord, Rivière Rouge, North Petite Nation, South Petite Nation, Rivière du Lièvre, Gatineau, Rideau, Madawaska, Bonnechère, Coulonge, Black River, Petewawa, Rivière du Moine, Mattawan and the Montreal river, and of these the largest is the Gatineau, which falls into the Ottawa from the north about 1½ miles below this city, after a course of about 400 miles, and having drained about 9 000 square miles of territory.

The Ottawa Valley

was for a considerable distance explored by the early French voyageurs, and passed through by the Hudson Bay and Northwest fur traders at a very early date, but little or nothing was done to promote its settlement or open it up to the ways of civilization until the latter end of the 18th, or the present century, when a colony was planted at Hull, on the opposite side of the river, about the year 1800; and these early settlers may be said to have been the pioneer farmers, lumberers, manufacturers, and merchants of this thriving district surrounding the capital of the Dominion.

The Lumber Trade.

The principal manufacturing industry in connection with the Ottawa Valley belongs to the production of square timber and sawed lumber, principally in white pine.

As many as 160 rafts of square timber have, in prosperous times, been taken annually from the Upper Ottawa limits or timber berths, and upwards of a million and a half of sawlogs. A raft of square timber may be said to contain on an average 80 subdivisions or cribs, equal to about 100 000 cubic feet in the aggregate. A crib of timber is about 25 feet in width by the length of the sticks, ranging from 35 to 80 feet, and the total output ranges from 12 000 000 to 16 000 000 cubic feet annually for this district. To facilitate the descent of timber on

the Ottawa, the Government first constructed slides at the various falls on the river about forty years ago, and the cribs are passed through them to escape the chutes. The principal slides on the Ottawa are at this city, at the Chats, 36 miles above this place, and at the Calumet Station, 65 miles from Ottawa.

The fall at the Chaudière (this city) is upwards of 30 feet, which is overcome by the slides in less than half a mile.

On the main tributaries the timber and sawlogs are passed through what are known as single stick slides to escape the chutes. These slides are about 5 ft. to 6 ft. wide by 3 ft. or 4 ft. deep, and in some instances are upwards of half a mile in length. At some of these structures, such as the Coulonge and Black River, the pieces of timber and logs are shot through with great velocity. Timber is guided through the safe channels, and kept under the control of the raftsmen in dangerous rapids by systems of piers and booms.

Square timber is exported from Quebec chiefly to the British and other European markets.

At the City of Ottawa, City of Hull and immediate vicinity, about 1 000 000 of sawlogs are cut up annually, producing about 200 000 000 feet B. M. of sawed lumber, the great bulk of which finds its way to the United States markets, the remainder being sent to Europe in the shape of deals, or absorbed by builders and others for home use. Sawed lumber on its way to market from this neighborhood takes the water route principally, although of late years the quantities transported over the various systems of railway tapping the Ottawa Valley have been very considerable, and likely to be largely increased with additional improved outlets.

About 29 years ago the Canadian Government leased the first installment of the Chaudière water privilege, and since then sold all the hydraulic lots, about 25 in number. With each lot power equivalent to the driving of 10 runs of stones is guaranteed, so that about 3 000 horse power may be said, through the agency of the Chaudière Falls, to be developed within the city limits. The lumber manufacturing establishments at this point are stocked with the most improved modern machinery, and, taken in connection with mills of a similar nature, and the very extensive match and pail factories at the City of Hull, on the opposite side of the river, form a source of attraction to scientific men and practical mechanics from various quarters of the globe. The various works for facilitating the moving of lumber on the Ottawa and its tributaries are under the control of the Minister of Public Works for the Dominion of Canada.

Minerals.

The Ottawa Valley is also rich in mineral productions. Within a short distance of this city there are immense beds of iron ore and

deposits of apatite or phosphate and plumbago in abundance. These, so far as they have been worked, have proved to be most excellent in quality, and only await the action of capitalists for development on a large scale, the more especially as the system of railways already constructed, and those now in progress and projected, cannot fail to give to the City of Ottawa and its environs a commanding position as a distributing centre.

On Saturday, previous to the session of the Convention, an exhibit was made of the high water service of the City of Montreal and of the working of its fire brigade. On the same day, after the adjournment of the Convention, the La Crosse grounds were visited and a game between the two prominent clubs was witnessed.

On Saturday evening a large number of the party proceeded, via the Grand Trunk Railway, to Quebec, staying at that city until Monday evening.

Another party on Monday went by steamer to Quebec by invitation of the Harbor Commission of Montreal through John Kennedy, Esq., member A. S. C. E., the Chief Engineer of the Commission. During this trip down the St. Lawrence the interesting work of deepening the channel by dredging was witnessed at a number of points.

In conclusion, it should be stated that the reception given to the Society in Canada was extremely cordial, and that remarkably complete arrangements had been made for the meetings at McGill University, for travel on the railways (largely provided by the courtesy of the Grand Trunk Railway, the Quebec, Montreal, Ottawa & Occidental Railway, and the Pullman Palace Car Company), for comfort at the hotels and for visits by carriage and steamer to various points. The Committees at Montreal and at Ottawa perfected and successfully carried out these arrangements, and the fact that the Canadian members of the Society were greatly aided in their work by a number of gentlemen who were not members renders this acknowledgement peculiarly appropriate.

The following members were in attendance at the Convention: —James H. Armington, Brooklyn, N. Y.; George D. Ansley, Montreal, Canada; E. W. Bowditch, Fred'k Brooks, Boston; William S. Barbour, Cambridgeport, Mass.; Henry A. Bently, Newport, R. I.; John W. Bacon, Danbury, Conn.; John Bogart, Alfred P. Boller, D. Bontecou, Henry R. Bradbury, New York; L. L. Buck, Brooklyn, N. Y.; A. Bonzano, Phœnixville, Pa.; R. J. Brough, Toronto, Canada; Wilson Crosby, Bangor, Me.; E. L. Corthell, North Egremont, Mass.; Francis Collingwood, J. James R Croes, New York; C. Constable, Constableville, N. Y.; C. L. Crandall, Ithaca, N. Y.; Martin Coryell, Lambertville, N. J.; Amory Coffin, Phœnixville, Pa.; E. S. Chesbrough, Chicago;

E. C. Davis, Northampton, Mass.; A. J. Du Bois, New Haven, Conn.; Joseph P. Davis, New York; E. A. Doane, Oswego, N. Y.; Alex. Dempster, Pittsburgh; S. Clarence Ellis, Boston; Charles D. Elliot, Somerville, Mass.; Theo. G. Ellis, Hartford, Conn.; Thomas Egleston, New York; George D. Emerson, Rolla, Mo.; Robert Fletcher, Hanover, N. H.; James B. Francis, Lowell, Mass.; Charles A. Ferry, Charles E. Fowler, New Haven, Conn.; Charles H. Fisher, Albany, N. Y.; Sanford Fleming, Ottawa, Canada; Bryant Godwin, New York; C. S. Gzowski, Toronto, Canada; Albert B. Hill, New Haven, Conn.; Stephen S. Haight, Bentley D. Hasell, Sullivan Haslett, New York; Wm. P. Harris, Newark, N. J.; E. P. Hannaford, Montreal, Canada; R. Hering, Philadelphia; J. E. Hilgard, Washington, D. C.; George A. Kimball, Somerville, Mass; Louis H. Knapp, Buffalo; John Kennedy, Montreal, Thomas C. Keefer, Ottawa; Samuel Keefer, Brockville, Canada; E. D. Leavitt, Jr., Cambridgeport, Mass.; Charles Latimer, Cleveland; Thomas D. Lovett, Cincinnati; Wm. H. Lotz, Chicago; Sidney F. Lewis, New Orleans; Henry Manley, Boston; C. C. Martin, Brooklyn, N. Y.; Henry G. Morris, Philadelphia; Mansfield Merriman, Bethlehem, Pa.; C. S. Maurice, Athens, Pa.; A. G. Menocal, Washington, D. C.; Robert E. McMath, E. D. Meier, St. Louis; John MacLeod, Louisville; George H. Norman, Boston; S. C. Pierson, Meriden, Conn.; Henry G. Prout, New York; P. A. Peterson, Montreal, Canada; Joseph R. Richards, Boston; Robert L. Read, Cincinnati; D. McN. Stauffer, Boston; T. Guilford Smith, Buffalo; F. Slataper, C. L. Strobel, Pittsburgh; George H. Simpson, Terre Haute, Ind.; W. G. M. Thompson, Welland, Canada; John G. Van Horne, Jersey City, N. J.; Frank O. Whitney, Henry M. Wightman, Boston; Wm. H. Wiley, Wm. E. Worthen, New York; Charles D. Ward, Lebbeus B. Ward, Jersey City, N. J.; Ashbel Welch, Lambertville, N. J.; H. F. Walling, Washington, D. C.; Fred. C. Weir, Cincinnati; A. F. Wrotnowski, New Orleans.

MEETINGS OF THE SOCIETY.

JUNE 1ST, 1881.—The Society met at 8 P. M. Vice-President Welch in the chair.

Ballots were canvassed and the following candidates declared elected:

As Members, Jacob Blickensderfer, of Omaha, Neb.; Robert Blickensderfer, of Terminus, Montana; Cabell Breckenridge, of Chattanooga, Tenn.; Stephen S. Haight, of West Farms, N. Y.; William P. Harris, of Newark, N. J.—as Junior, Hunter Stewart, of St. Louis, Mo.

The following amendment to the Constitution was presented and read: Any member or associate whose subscription is not in arrears may compound for future annual subscriptions by the payment of three hundred dollars, if he is a resident, and of one hundred and fifty dollars,

if he is a non-resident. But should a non-resident become a resident he shall pay the remainder of the composition, viz.: one hundred and fifty dollars, or the usual annual subscription during the time of his residence.

This amendment was signed by the following named members: G. Bouscaren, William E. Merrill, Robert L. Read, F. de Funiak, C. Shaler Smith.

The paper by C. L. McAlpine, read May 18th, 1881, was discussed by Messrs. Chesbrough, Wm. Sooy Smith, Welch, Macdonald, Joseph P. Davis, Striedinger and (by letter) William R. Hutton.

JUNE 17TH, 1881.—Business meeting at Thirteenth Annual Convention. The President, James B. Francis, in the chair.

The following report of the Committee on a Uniform Method for Tests of Cements was read by the Secretary:

To the American Society of Civil Engineers.

JOHN BOGART, *Secretary:*

The undersigned, Chairman of the Committee appointed to devise and report a uniform method of cement tests to your Society, desires to make the following report of progress:

The Committee have had under advisement during the past year the matter of forms of test specimens, and of what kinds of tests should be employed, and such matters as are closely connected therewith. It is found the European practice generally embraces tests of mortars composed of certain definite mixtures, by weight, of cement and sand; that is to say, one weight unit of cement with one, two, three or four units weight of sand. No one can question the advisability of testing mortars containing the sand mixture, as in practice the bulk of our mortars is largely composed of sand. It has been the desire of the Committee to so perform their duty that whatever system they might recommend would be one from which the results of different experimenters could be compared in arriving at a correct opinion of quality, and that the system might be one that in a few years the Society would not be compelled to change. Knowing that our American hydraulic cements vary in weight of equal bulks 20 per cent. and over, and that almost similar variation exists in the weight of equal bulks of sand, it is readily seen that the European practice of using equal units of weight, regardless of bulk, in making mortar mixtures, would *per se* be so indefinite as to preclude comparability of tests. The variability of sand in weight, in fineness and in sharpness caused me to hesitate, in pressing before the other members of the Committee, the advisability of making our final report until I had an opportunity to make, at least, a partial examination of the physical qualities of our American sands, and to this end, at about the termination of last year, I had devised a scheme for making a collection

of sands from different sections of our continent, and, when received, intended to carefully examine same as to sharpness, fineness, voids and weight of equal bulks, &c., so as to proceed understandingly with the duty allotted to us, and, if possible, engraft in the system of tests only such safeguards as were found absolutely necessary, as it is the undoubted desire of not only the members of the Society, but of your Committee also, that any system of tests should be made as simple as possible consistent with the end desired—uniformity. When ready to commence this inquiry, severe domestic affliction visited my household which precluded my devoting evenings to this study. For many years previously the greater share of my evenings have been devoted to the subject of cements, and my other duties are such that I have no other time to spare for this subject. The affliction to which I alluded still continues, and may continue for months, and until this ends I can give the subject very little thought; but when it does end I hope and intend, whether continued as a member of said Committee or not, to pursue the inquiry, and report the results to your Society. At present I can only say that my knowledge of the subject is so deficient in this and some other particulars that I do not feel it advisable or safe to ask your Committee to formulate a system of cement tests such as will be demanded and will suit our American products and practice.

With more knowledge and under favorable circumstances, which I trust to secure during the present year, I hope to feel competent to aid any Committee you may continue or appoint for the purpose in defining a proper mode of conducting tests of cements.

Respectfully submitted,

D. J. WHITTEMORE,

Chairman.

Milwaukee, June 6, 1881.

On motion, the report was received, and the Committee continued.

The Secretary read a supplementary request on the same subject, as follows:

The Committee appointed by the American Society of Civil Engineers to devise a uniform method of cement tests, desire to procure from several localities throughout the United States and Canadas specimens of sands ordinarily used in the fabrication of cement mortars for the purpose of investigating their properties as to fineness, weight, voids, etc., with a view of recommending a practicable standard to be used in mortar mixtures of sand and cement for test purposes.

Will you kindly select and send the subscriber by express from your locality, say, two specimens, one of sharp bank sand, if you have any ordinarily used, also one specimen of shore washed or water worn sand, and mark plainly on each package your name and from what locality the sand is taken.

Please do not send much less or any more than about one pint of each kind of sand.

Yours very truly,

D. J. WHITTEMORE,
Chairman of said Committee.

The Secretary said that the Committee on the Preservation of Timber simply asked to report progress, stating that they were collecting a great many samples of timber from various parts of the country, and were endeavoring to put their investigations into form.

On motion, the report of progress was received, and the Committee continued.

The Secretary read the following report of the Committee on Tests of Iron and Steel:

To the President of the American Society of Civil Engineers:

SIR,—The Committee of the American Society of Civil Engineers on Tests of Iron and Steel, beg leave to submit the following report:

As the members of the Society must be aware, the United States Board appointed to test American iron and steel was legislated out of existence just as its labors, which promised to be invaluable, had fairly commenced. By far the best testing machine in the world had been constructed and erected under the direction of this board, and with funds appropriated for the purpose by the Congress of the United States, at the urgent solicitation of the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Iron and Steel Association, and other scientific societies and institutions.

The scientific and technological schools and colleges of the whole country joined earnestly in recommending and urging these appropriations. These solicitations and recommendations clearly indicate the general interest felt throughout the country in this effort to obtain, for the use of all, such accurate knowledge of the qualities of the iron and steel used in the United States as would guide to their safe employment for all the purposes to which they are applied in the trades, arts and industries of the country.

The legislation obtained and the organization of the board and the investigations and experiments planned by it were broad and comprehensive, and the labors of the board were auspiciously begun. Meantime repeated efforts had been made to subject the board to the control of the Ordnance Department of the United States army. This, in the opinion of your Committee, would have resulted in injurious limitations on the labors of the board, and it would have been unjust to the engineer officer of the United States Army, to the two officers of the United States Navy, and to the three civil engineers who were members of the board.

On the other hand, no good could result from such control, and no reason could be discovered for the efforts made to obtain it, other than the desire of the Ordnance Department to secure to itself the credit of the investigations to be made by the board.

These facts have been presented to the Society in previous statements made to it by your Committee, but they have thus far failed to arouse the Society to such action as would have prevented the hostile legislation in the first instance, and which will yet, if vigorously taken, secure the passage of a new bill repealing it, rehabilitating the board, and restoring the testing machine to the uses for which it was intended and built.

Your Committee would therefore recommend that a memorial and petition to Congress be prepared and signed by the officers of the American Society of Civil Engineers, setting forth the history of the effort made to secure a complete set of tests of iron, steel and other materials used in construction in this country, and praying that the board legislated out of existence shall be reappointed, the testing machine built under its direction restored to its possession, and that additional appropriations be made to enable the board to complete its labors.

If this recommendation is approved and carried into effect, your Committee also recommend that every member of the American Society of Civil Engineers shall take an active personal interest in obtaining the favorable action of Congress upon the petition proposed, and that the Society, as such, shall ask the active co-operation in this effort of all the sclentific societies and colleges, and of the associations of tradesmen, mechanics, engineers and manufacturers in our country.

In response to a request sent to Colonel T. T. S. Laidley, U. S. Ordnance, President of the late U. S. Testing Board, he has kindly furnished your Committee with the following report of the duty performed by the testing machine:

WATERTOWN ARSENAL, June 11, 1881.

Gen. W. S. SMITH, No. 31 East 22d street, New York:

DEAR SIR,—In reply to your inquiry of this date, I have to say, that since the 1st of July last, when the funds became available, the testing machine has been constantly at work, about one-half of the time for private individuals, the Pennsylvania Railroad Co., the New York and Brooklyn Bridge, Passaic Rolling Mill Co., Mr. Andrew Kloman, and Mr. E. D. Leavitt, Jr., being those who have had most work done. 734 specimens have in all been tested.

The first work was to test the cylinders of cast iron prepared under authority of the board for testing iron and steel. The results in brief are given in the annexed table, and establish the important fact that

cast iron, such as is used in making guns, makes a stronger gun than a similar one made of cast and lined by a wrought iron tube.

Experiments have been made on the resistances of woods, and provision made to extend them much, as soon as the wood shall have become sufficiently seasoned.

Arrangements have been made to test a large number of iron columns, and this will commence in a day or two.

Trials have been made on the transverse strength of pins of various sizes and lengths, and on sliding and rolling friction.

Experiments have been made to determine the effect of rerolling iron for bridge work. Quite a number of tests of eye bars have been made to determine the best method of forming the eyes, the strength of riveted work for boilers, and bridges, wire rope and fastenings, open hearth steel, stone, etc., etc. The experiments made for individuals will not be published; those made on Government account will accompany the report of the Chief of Ordnance.

It is much to be regretted that the law was passed requiring the use of the machine to be given to any one who will pay the actual expenses, for, as the law now stands, such persons have the precedence.

Respectfully yours,

T. T. S. LAIDLEY,
Colonel of Ordnance, Commanding.

CYLINDER TESTS.

Distinguishing Mark.	Under Initial Load of 5 000 lbs. on Piston.			Ultimate Loads.	
	Length of Bore filled with Wax.	Surface of Bore exposed to Wax.	Volume of Wax, cubic inches.	Actual lbs.	Lbs. Sq. Inch Internal Pressure.
	Inches.	Sq. Inches.			
A 1	10.064	113.00	86.23	769.200	83.518
A 2	10.371	116.37	89.13	737.600	85.867
A 3	10.445	117.03	89.62	792.500	92.366
B 1	10.097	112.71	85.62	635.500	74.936
B 2	10.010	118.81	84.88	687.900	81.120
B 3	10.471	116.57	88.79	660.200	77.853
C 1	10.388	115.71	88.09	735.400	86.722
C 2	10.385	115.61	87.96	698.100	82.420

A Lined with thin copper $\frac{1}{10}$ inch thick.
B Lined with wrought iron 0.912 inch thick.
C Lined with bronze 0.508 inch thick.

Cylinders 22 inches long, 11 inches diameter. Diameter of bore, 3.3 inches.

A 1 and A 2 were bored through, and the breach end closed with a screw.

T. T. S. LAIDLEY,
Colonel of Ordnance.

Respectfully submitted,

WM. SOOY SMITH,
Chn. Com. on Tests of Iron and Steel.

A. P. BOLLER.—This commission was commenced as long ago as 1873 or '74. I was familiar with its constitution at the time, and did what share of work I could to get it launched and into practical working order. Since that time we have been much disappointed in the results obtained by that commission, and from the admissions of their own report there is evidently such a clashing of authority that we cannot expect the work to advance in the direction or to the extent that we all hoped for. I would move, therefore, in order to examine the true condition of affairs, and without any disrespect to the gentlemen composing the commission, that the report be referred to the Board of Direction for examination as to its inferences and charges, and that the committee be discharged and thanked for the work they have done up to the present time. The result of such action will be, I think, getting at the real facts of the case, and a reorganization as it were, of the part our Society has taken and must take in furthering this work ; for there is no scheme that has been started for the advancement of American engineering, in my judgment, comparable with the work that was laid out for the investigation of that commission. It is so far beyond the possibility of private effort that we must have hearty Government co-operation in it. No steps should be taken unadvisedly or hastily, and it is for that reason I move that the report be referred to the Board of Direction for examination, or to a special committee—I do not care which—for examination into the charges and jealousies therein contained, to report to the Society for future action, and that the committee be discharged with thanks for past labors. But as it would be better to divide my motion into two parts, I would move first for the acceptance of the report, and the discharge of the committee with thanks.

Motion agreed to.

A. P. BOLLER.—I now move that a special committee be appointed to whom that report shall be referred for report at the earliest practicable moment, with recommendations as to the future action of the Society in the matter.

F. COLLINGWOOD.—To whom does that report come ?

A. P. BOLLER.—It was to be a committee to examine into the working of the commission, and into the charges conveyed in their report. We are

plainly told that the differences and jealousies between the civil and military departments have utterly blocked the useful working of the commission, and we will stand where we are to all eternity if we do not have that obstacle removed out of our way.

The PRESIDENT.—I question whether that is a proper mode of proceeding, whether it would be altogether in order to appoint a committee to report upon the action of another committee just discharged. Of course, it is just as gentlemen choose to vote.

T. EGLESTON.—It is necessary that the bottom facts of this case should be known, but it is not necessary that the conduct of the committee should be scrutinized. It is possible, however, that somebody in authority should know exactly what the reasons are why this commission has failed of its object. In view of the greatest engineering problem that has been started in 200 years, and with the prospect of our doing for the metals what has never been done or even thought of before, it does seem to be about time this commission was organized and at work. Here is a commission with a large amount of money, with the patronage of the Government and the sympathy of its officers, with the machine already in hand, and yet it has not succeeded. I think it is desirable that somebody should know the reason why; it is not, I think, desirable that if there is any personal jealousy, or if there is anything approaching to a scandal, it should be made known to the public. The Governing Board of this Society is quite competent to discuss any question that may come up, and it therefore seems to me that if a committee is appointed to look over this matter and see what shall be done in the future, it should report to the Governing Board of this Society, and the advice of that Board should be taken. This investigation is of great interest, not only to engineers, but to all mankind, because it involves the whole question of factors of safety, and if there is to be any reorganization, the action preliminary thereto should come from the governing body of this Society.

The PRESIDENT.—I do not question at all the propriety of the investigation, but simply the form of proceeding to arrive at it. The question is whether it should be done by a new committee, with full powers to pursue the matter.

A. P. BOLLER.—It is apparently a little difficult to get at. We are not prepared now to appoint a new committee to prosecute this subject. A committee of that character must be selected with a great deal of forethought, and a great deal of examination into the qualifications of the members, and the time they can give to the matter. The obstacles which that report tells us exist, must be examined into in some form or shape, and I can conceive of no other way of doing it than to refer that report to a committee, or to the Board of Direction—I do not care which—for examination and deliberation as to the further action this Society should take in furtherance of the object of this great commis-

sion, for no greater one in the interests of science has ever been started. I am willing to accept any amendment that will get over questions of test or competency, for I am deeply convinced we must do something before we separate this morning for carrying forward the object of that commission.

The PRESIDENT.—My objection was to the appointment of a committee to criticise the action of a committee whose report we had just accepted. I question whether that would be in order, or is a proper thing for the Society to do. I think, however, it would be in order to refer it to the Board of Direction, with full power to pursue the matter.

A. P. BOLLER.—I am perfectly willing that the Board of Direction should take it up, and possibly we might profitably discuss the matter a little more before we pass a final resolution upon it. But as I have stated my views on the matter, and how I stand, I will withhold pressing my motion until we have heard further from the members of the Society.

F. COLLINGWOOD.—I think we can get over this difficulty by changing the words of the motion. It is in the minds of members about me, that a committee should be appointed, but there is an objection to the motion taking the form of criticism. I think it is not desirable that we should ask the Board of Direction to undertake the matter because they have already a great deal of work to attend to. The committee should be composed of men who have more leisure, and I would, therefore, suggest that the motion be put into this form : That a committee be appointed to examine further into the subject, and to report a recommendation to the Board of Direction, who shall take such action as they see fit. I think that will meet the whole matter.

Mr. BOLLER.—I accept that as an amendment.

C. LATIMER.—It seems to me the appointment of another committee to continue the same subject is a criticism upon the former committee that has been discharged.

I am not acquainted with the merits of the question ; but it seems to me that I would not like to see another committee appointed to throw discredit upon a committee that has already done something and to throw discredit on their work. I think it would be better to refer the matter to the Board of Management to decide on the merits of the work, and that the committee should do what may be further necessary in order to carry out what the Board may recommend.

The PRESIDENT.—I should say it was perfectly in order to criticise the report of that committee before it was accepted, but after it has been received, I do not think it is in order to criticise what they have done.

A. P. BOLLER.—May I ask if a new committee is appointed to be active commissioners in the matter, whether the reports and past observations on this matter are not open to examination and criticism ? Whether the reports of the Board or the reports of a special committee on any other subject may not be examined, and whether it is not perfectly

competent for us to review the whole question, and see where the difficulty lies, and if there is difficulty, to remove it before there is trouble? It is impossible to couch the motion in such terms as to preclude all criticism. I do not propose to critcise that committee. They are all gentlemen whom I esteem very highly, and I believe they have worked to the best of their ability in the matter. But they have evidently come to a standstill, and now we must find out just where that difficulty lies. When a matter of great importance is up, I do not believe in mincing matters. I believe in going to the root of the difficulty, and when that is found to eradicate it.

THE PRESIDENT.—It is perfectly in order to refer the same subject to a new committee

A. P. BOLLER.—Very well, that is the point Mr. Collingwood made, and I accepted that as an amendment to my motion.

J. J. R. CROES.—There is a certain mystery in all this that we who are uninitiated cannot understand. We have a report presented which asks that this Society do something. We receive that report and discharge the committee. Then we ask for a committee to be appointed or for the Board of Direction to do something, but nobody seems to have a clear idea of what they do want, or of what the matter is. Why do not gentlemen who have these grievances behind them state whether they are against the Committee of the American Society of Engineers, or the National Board, or the Ordnance Board, or Congress, or whoever it may be. If they would state who it is they want to hit so that we can find out who they are, we will be much better satisfied, and it could be done in five words then.

A. P. BOLLER.—I do not know whether my friend, Mr. Croes, took a nap during the reading of that report, but I think the report itself is abundant cause for the discussion we have had on this subject. I have no grievance against Congress, or against the Engineers, or against the Ordnance, or against the Society, or against anyone else. I simply know that by their own admission their work has come to a standstill. They make certain charges in the report which, divested of all rhetoric and of all complimentary terms, reveals a clashing between the components parts of the Board, the one civil and the other military. Now there may be two sides to this question, as there generally are to all questions, and I am very anxious to get at the secret and see exactly what the trouble is. Unless we do that our past work is good as far as it has gone, but it is so far short of what we have been striving for that it is a confession of failure to stop at this point.

C. LATIMER.—I would like to know what the members of the committee themselves think of the matter. It seems to me that if there is anything kept back, any trouble in the Commission, they ought to know all about it, certainly, and if they would only explain it to us now, we would be much obliged to them. It seems to me a curious proceed-

ing to appoint another committee to examine into the doings of a previous one.

T. Egleston.—I do not think there is any ambiguity or hinting in the matter. If there are words in the English language that can state plainly what the difficulty is, I think those words are contained in the report. The gist of the whole matter is this: I have had occasion to use that testing machine in making some investigations recently, and I went to Washington, to headquarters, to ascertain what the conditions were under which I could use it. I found every engineer officer and every government officer extremely anxious that the Commission should go on and do the work. I went back to New York and the several members of the Commission were also extremely anxious. I talked with Col. Laidley and found that he was extremely anxious In the meantime I have found that certain members of Congress are extremely anxious that the work should be done. But when you come to look over that report you will find the Chairman of the Committee states positively that he could not report to the Ordnance Department, and that the Committee of this Society preferred that the whole thing should die without a motion in its behalf, rather than that they should report to the Ordnance Department. I think that is the short of it.

Mr. Boller's motion, as amended by Mr. Collingwood, was adopted.

The President.—The Chair will make the appointment and announce the names of the committee hereafter. (See page 40.)

J. J. R. Croes then reported verbally: The Committee on the Gauging of Streams has the honor to report that a considerable correspondence has taken place with members in various parts of the country who have been asked to make gaugings of the streams in their vicinity, and to send them to the Society for tabulation. No response has been received since the meeting in last November. At that time a paper was presented by Mr. Fteley, of Boston, on the gauging of the Sudbury river, which paper was discussed to some extent, and is now in print and will probably be issued in the next number of the Transactions. The work of the committee will be seen, to some extent, in that paper, and in the discussions upon it. Further papers on the same subject have been promised by Mr. Fteley and will be forthcoming probably in a month or two. The result of the applications for gaugings, sent to all parts of the country, has not been so satisfactory as the committee would desire. In very few instances have any responses been received at all, and these responses were to the effect that the parties applied to had not measured any streams at all. The committee ask to be continued.

On motion the report was accepted and the committee continued.

The Secretary asked if any member of the Society had any business to propose.

C. Latimer.—There has been heretofore a standing resolution on our

statutes that the metric measures be put upon the papers of this Society. I move that that resolution be rescinded.

The PRESIDENT asks for information.

The SECRETARY.—At the Ninth Annual Convention of this Society a resolution was passed that, thereafter in all papers written for the Society, members should include in such papers the dimensions in metric measure as well as in English feet and inches, and that this resolution should be published continuously in the Proceedings of the Society. It has been so published since that Convention.

T. G. ELLIS.—I would like to ask the Secretary whether any members have availed themselves of that resolution to put metric measures in any of their papers?

The SECRETARY.—Two, I think, since I have been Secretary.

T. G. ELLIS.—Is there any other such standing resolution?

The SECRETARY.—Not that I am aware of.

T. G. ELLIS.—I think under these circumstances it is not necessary to print it for the benefit of two papers in so many years. I think if it stands we should add the measures of other nations where we have more resident members than we have in the case of France. For instance, in Mexico and South America we have more resident members than we have in any other country whose metric system we are acquainted with.

T. EGLESTON.—The metric system is adopted in Mexico.

C. LATIMER.—That is true, and Mr. Wellington says it has produced such confusion that he does not know where he is. I have a letter from him to that effect.

A. P. BOLLER.—With regard to the motion rescinding the resolution it does not make much difference except to expunge from the record an inoperative resolution. There is nothing to prevent any member putting as many measurements into his paper as he chooses. The fact that only two papers have included metric measurements during Mr. Bogart's secretaryship shows that members do not regard this as a compulsory resolution, but one they can disobey at their own pleasure. As long as the resolution must be a dead letter, and we cannot compel members to abide by it, perhaps we had better expunge it from the record.

Mr. Latimer's motion was submitted to a vote, and adopted by 28 for, to 9 against.

The business meeting of the Convention was then adjourned.

OF THE BOARD OF DIRECTION.

JUNE 8TH, 1881.—Applications were considered. Action was taken in regard to the Building Fund and the Fellowship Fund.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

		Date of Election.
BLICKENSDERFER, JACOB	Chief Engineer Union Pacific R.R., Omaha, Nebraska	June 1, 1881
BRECKENRIDGE, CABELL	Engineer Alabama Great Southern R.R. Chattanooga, Tenn	" "
HAIGHT, STEPHEN S	West Farms, New York City, N. Y	" "
HARRIS, WM. P	Supt. New York and Greenwood Lake R. R., 37 Alling St., Newark, N. J	" "
MUNROE, HENRY S	School of Mines, Columbia College, New York City, N. Y	May 4, 1881
SYMINGTON, WILLIAM N.	P. O. Box 2011, New York City, N. Y	" "
WHINERY, SAMUEL	(Elected Junior April 1, 1874,) Ass't. Eng'r. New Orleans and North Eastern R. R., Meridian, Miss	" "
WILDER, FRANCIS M	Sup't. M. P. Department N. Y. L. E. and W. Railway, Susquehanna Depot, Pa.	Jan. 5, 1881

ASSOCIATE.

GORRINGE, HENRY H	32 Waverly Place, New York City, N. Y.	April 6, 1881

JUNIORS.

ALLAIRE, WILLIAM M	358 West Thirty-second St., New York City, N. Y.	March 2, 1881

CHANGES AND CORRECTIONS.

MEMBERS.

BECKWITH, ARTHUR.....115 Broadway, New York City, N. Y.
BECKWITH, L. F.....115 Broadway, New York City, N. Y.
DOANE, EDWIN A.....Chief Engineer R. W. & O. R. R., Oswego, N. Y.
ELLIS, N. W.....33 Pine St., Room 19, New York City, N. Y.
FLAGG, J. FOSTER.....Div. Engineer, Mexican National R. R., Manzanilla, Mexico.
FULLER, S. T.....Chief Engineer Texas Mexican R. R., Houston, Texas.
GOLAY, PHILIP.....Paducah, Ky.
HARRIS, ROBERT L.....(Ross & Harris,) San Antonio, Texas.
NEILSON, CHARLES.....Sup't. Delaware Div. N. Y., L. E. and W. Railway, Port Jervis, N. Y.
WALKER, JOHN S.....Ass't. Engineer Mex. National Cons. Co., Laredo, Texas.
WARD, CHARLES D.....Windsor Hotel, Jersey City, N. J.
WARD, LEBBEUS B.....Windsor Hotel, Jersey City, N. J.

JUNIORS.

BROOKS, FRED'K.....Office Mexican Central Railway, Mexico, Mexico.
CURTIS, WENDELL R ....California Southern R. R., San Diego, Cal.
FERGUSON, JOHN W.....Ass't. Engineer N. Y., L. E. and W. Railway, Hornellsville, N. Y.

FELLOWS.

DILLON, SIDNEY .....President Union Pacific R. R., 78 Broadway, New York City, N. Y.
NORTON, F. O.....92 Broadway, New York City, N. Y.
SEYMOUR, M. T.....55 Broadway, New York City, N. Y.

DEATHS.

WEBER, M. M. BARON VON.,Elected Honorary Member June 2, 1880. Died April 18, 1881.
HALL, G. THOMAS .....Elected Associate October 2, 1872, and transferred to Member September 2, 1874. Died June 2, 1881.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. VII.—July, 1881.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JULY 6TH, 1881.—The Society met at 8 P. M., Vice-President Welch in the chair. Ballots were canvassed and the following candidates declared elected:—As Members, Oliver Weldon Barnes, New York City; William Anderson May, Scranton, Pa.; James Gardner Sanderson, Scranton, Pa.:—As Associate, Henry Robert Bradbury, New York City. The Norman Medal for the last year was formally presented to Theodore Cooper, M. A. S. C. E.

ADDITIONS TO

LIBRARY AND MUSEUM.

From S. Thayer Abert, U. S. C. E. Washington, D. C.:

Annual Report on Improvement of Rivers and Harbors in District of Columbia, Maryland, Virginia and North Carolina. S. Thayer Abert.

From Administration des Ponts et Chaussées, Paris:

Annales. February, March, April and May, 1881. List of Members, 1881.

From American Academy of Arts and Sciences. Boston:

Proceedings. Vol. VIII., New Series, Part I., May, 1880 to February, 1881.

From American Chemical Society, New York:

Journal of the Society. Vol. II., Nos. 8-12, August, December, 1880.

From American Institute of Mining Engineers, Dr. T. M. Drown, Secretary, Easton, Pa.:

Proceedings of the Annual Meeting held in Philadelphia, February, 1881.

The Gold-Bearing Mispickel Veins of Marmora, Ontario, Canada. R. P. Rothwell.

The Whopper Lode, Gunnison County, Colorado. Prof. Persifor Frazer.

Steel for Bridges. J. W. Clowd.

The advance in Mining, Metallurgical Art. Science, and Industry since 1875. W. P. Shinn.

Shocks on Railway Bridges. J. W. Clowd.

The Industrial School for Miners and Mechanics at Drifon, Luzern Co. Pa. O. J. Heinrich.

Gas Producers using Blast. F. H. Daniels.

Effect of Sewage on Iron. C. O. Thompson.

The Construction on Geological Cross-sections. H. Martyn Chance.

Ore Roasting Furnace. W. J. Taylor.

Note on the Estimation in Speise. F. C. Blake.

Method for the Estimation of Manganese in Spiegels, Irons and Steels. S. A. Ford.

Note on a Direct Process for Treating fine Iron Ores. W. E. C. Eustis.

A Fluxing Gas Producer for making Heating Gas. W. J. Taylor.

The Amount of Manganese Required to remove the Oxygen from Iron after it has been blown in a Bessemer Converter. S. A. Ford.

Notes on the Assay Spitzlutte. R. H Richards.

On the Applicability of Edison's System of Electric Lighting to Mines. O. A. Moses.

A new Bottom for Bessemer Converters. C. F. Manness.

Auriferous Slate Deposits on the Southern Mining Region. P. F. Mell, Jr.

Can the Magnetism of I on and Steel be used to Determine their Physical Properties? Wm. Metcalf.

On the action of Common Salt and other Crystalline Salts in Wire-Drawing. C. O. Thompson.

On Rail Patterns. A. L. Holley.

From American Iron and Steel Association. James M. Swank, Secretary, Philadelphia:

Preliminary Report upon the Iron and Steel Industries of the United States in the Census year 1880, ended May 31, 1880. James M. Swank. Philadelphia, 1881.

From Argentine Scientific Society. Don Eduardo E. Clerice, Secretary, Buenos Ayres:

Annales. February, March and April, 1881.

From Arthur Beardsley, Bethlehem, Pa.:

Register of the Lehigh University, 1880-1881.

From Thomas J. Bell, Cincinnati:

Forty-first Annual Report of the Water Department of Cincinnati.

From Charles E. Billin, Indianapolis, Ind.:

Proceedings of the Convention of Engineers and Surveyors of the State of Pennsylvania, held at Harrisburg, Pa., Oct. 27th, 28th and 29th, 1881 (*Copies for distribution*).

From Boston Society of Civil Engineers. S. E. Tinkham, Secretary, Boston:

Proceedings, April, 1881. Annual Meeting of the Society, March, 1881.

Annual Report of the Government.

The Back Bay Park. E. W. Howe.

From Boston Public Library, Boston:

Bulletin of the Library. April, 1881, Vol. IV., No. 10.

From G. Bouscaren, Cincinnati:

Instruction for Laying out Circular Curves with Special Approaches. G. Bouscaren. (Several copies).

From Lyman Bridges, San Francisco:

Report on the San Francisco and Ocean Shore Railroad Co., California. New York, 1881.

Report on the California Central Railway in California and Nevada. New York, 1881.

From L. L. Buck, Brooklyn, N. Y.:

Report on the Renewal of Niagara Suspension Bridge. L. L. Buck. New York, 1881 (2 copies).

From Bureau of Education, Washington, D. C.:

Report of Commissioner of Education for 1878.

Library Aids. Samuel S. Green.

Comparative Statistics of Elementary Education in Fifty Principal Countries.

From H. M. Chance, Philadelphia:

The Construction of Geological Cross-sections. H. M. Chance, M. D., Philadelphia, 1881.

From M. A, Durand-Claye, Paris:

Les Eaux d'Egout. A. Durand Claye, Paris, 1880.

Les Travaux d'Assainissement de Danzig, Berlin, et Breslau. A. Durand Claye, Paris, 1881.

From Wm. B. Cogswell, Syracuse, N. Y.:

The Credit Mobilier of America. Rowland Hazard, Providence, 1881.

From John Collet, Chief of Bureau of Statistics and Geology of Indiana, Indianapolis:

Second Annual Report of Department of Statistics and Geology of Indiana.

From Jörgen Dahl, Norway, Sweden :
Types of Construction on the Norwegian Railways of 3 feet 6 inches gauge.

From Thomas M. Drown, Easton, Pa. :
An Address at the Reopening of Pardee Hall, Lafayette College, 1881, Easton, Pa.

From C E. Durkee. Albany, N. Y. :
Report on Routes and Estimates. Sacketts Harbor and Saratoga Railroad. Saratoga Springs, 1852.
The Adirondack Railroad and Estate. New York, 1873.

From Engineers' Club of Philadelphia, Howard Murphy, Cor. Secretary, Philadelphia :
Proceeding, Vol. II., No. 2.

From Engineers' Department, U. S. A. Washington, D. C. :
Official Army Register, January, 1881.
Lecture on the Progress of the Works of Completion of the new Improved Bed of the Danube at Vienna, by Sir Gustav von Wex. Translated by Gen. G. Weitzel, U. S. A.
Annual Report of the Chief of Engineers, U. S. A. Parts I., II., III., 1880.
The Water-jet as an Aid to Engineering Construction. L. Y. Schermerhorn, Washington, 1881.
Contribution to the Theory of Blasting or Military Mining. H. Höier. Translated by C. W. Raymond. Washington. 1881.
Specifications for Dredging in Inner Harbor at Michigan City, Indiana. Maj. J. A. Smith.
Specifications for Constructing Dams and Shore Protections of Brush and Stone, at Andalusia, Ill. Capt. A. Mackenzie.
Specifications for Dredging in the Galena River, Ill. Capt. A. Mackenzie.
Specifications for Building a Wing-Dam at Glastonbury Bar, on the Connecticut River. Gen. G. K. Warren.
Specifications for Improvement of Rancocas River, N. J. Col. J. N. Macomb.
Specifications for Rip-Rap for Jetties at the Mouth of Connecticut River. Gen. G. K. Warren.
Copies of Reports submitting plans for the Improvement of the Mouth of Columbia River. Colonel G. L. Gillespie.
A Report relative to devising a system of works to prevent the further injury of the navigable waters of California from the débris of mines arising from hydraulic mining. Col. G. H. Mendell.
A copy of the Report of the Board of Engineers examining the several points on the Pacific coast for the purpose of locating a harbor of refuge, and especially that relating to Port Orford, Oregon.
A Communication and Report upon the results obtained from the surveys and examinations of the season of 1880, for the establishment of Reservoirs at the headwaters of the Mississippi River and the sources of certain streams in Wisconsin and Minnesota, including Rock River, Wisconsin and Illinois. Capt. J. C. Allen.
The report of the Mississippi River Commission. (*Copies for distribution.*)
Specifications, Advertisement, Proposals, and Bidder's Bond for Improving Chicago Harbor. Maj. G. J. Lydecker.
Advertisement. Ohio River Improvement. Proposals for Iron Work at the Davis Island Dam. Col. Wm. E. Merrill.
Specifications for Dredging in Winnepissiogee Lake, New Hampshire. Gen. Geo. Thom.
Specifications for Breaking up and Removing Sunken Ledges in Merrimac River, Mass. Gen. Geo. Thom.
Specifications for Excavation of Sunken Ledges at the "Gut," opposite Bath, Me. Gen. Geo. Thom.
Specification for Dredging and Building a Rubble-stone Wing-dam in Kennebec River, at and near Richmond, Maine. Gen. Geo. Thom.
Specifications for the Construction of the Breakwater on the Saint Croix River, near Calais, Maine Gen. Geo. Thom.
Advertisement, Instructions, Specifications and Proposals for Improving Harbor at Menomoull (Mich. and) Wis. Maj. Henry M. Robert.
A Communication accompanying copy of Report upon the Survey of the Reopening of the Santee Canal, South Carolina. Gen. Q. A. Gillmore.

From Charles E. Fowler, New Haven, Ct. :
City Year Book of New Haven. 1880.
Annual Report of the Street Department of New Haven for 1880.
Public Parks : A Lecture by Simon E. Baldwin.

From Robert Gordon, Henzada, British Burmah :
Fragment containing a Discussion of a New Formula for Flow of Water in open Channels. Robert Gordon. Milan, 1875.
On the Theory of the Flow of Water in Open Channels, Robert Gordon. Rangoon. 1875.

From Geo. S. Greene, Jr., New York :
Annual Report Department of Docks, City of New York for 1880. (2 copies.)

From John W. Hill, Cincinnati :
Report of the Expert on the Contract Trials of the Gaskill Compound Pumping Engine at the Evansville Water Works. J. W. Hill, Cincinnati. 1881.

From E A. Hill, New Haven, Ct.:
Annual Report of the Boston & New York Air Line Railroad Company from 1878 to 1881, inclusive.
Statutes of the State of Connecticut relating to Railroads Hartford. 1878
The Hayford Process and Apparatus for Preserving Timber. E. R. Andrews. Philadelphia, 1878

From Institution of Civil Engineers, James Forrest, Secretary. London :
Minutes of Proceedings Vol. LXIII.

From M. E. Lavoinne. Paris :
The Purification of Memphis. St. Germain. 1881 (French),

From Massachusetts Institute of Technology, Boston :
Sixteenth Annual Catalogue of the Institute. 1881.

From A. G. Menocal, C. E., U. S. N., Washington, D. C.:
Transportation of Ships on Railways. Some of the difficulties presented. S. L. Phelps. Washington, 1881.

From Dr. W. H. McFadden, Philadelphia :
Annual Report of the Philadelphia Water Department for 1880. Philadelphia. 1881.

From Midland Institute Mining, Civil, and Mechanical Engineers, Barnsley, England :

Transactions. December, 1880. February, 1881.

From Edward Mitchell, New York :

Seventh Annual Report on the Progress of of the Topographical Survey of the Adirondack Region of New York. Verplanck Calvin. Albany, N. Y.

From Charles Neilson, New York :

Effect of the Motion of Air within an Auditorium upon its Acoustic Qualities. W. W. Jacques.

The History and Description of the Great Western Railway. John C. Bourne. London, 1856.

From Gen. John Newton, New York :

Report on a general scheme of Improvements for the Harbor of Montreal. by the Commission of Engineers. Mr. Robert B. Bell, Maj. Gen. John Newton, and Mr. Sandford Fleming. Montreal. 1877.

From North of England Institute Mining and Mechanical Engineers, New Castle-on-Tyne, England :

Transactions. December, 1880- February, 1881.

From Charles Paine, Gen. Supt. L. S. and M. S. Railway, Cleveland :

Eleventh Annual Report of the Lake Shore and Michigan Southern Railway Co. Cleveland. 1881.

Special Report of the Commissioner of Railroads and Telegraphs of Ohio. Columbus. 1881.

Reports of the Great Western Railway of Canada, from 1870 to 1880, inclusive.

From the Pi Eta Scientific Society, Troy. N. Y., 1881 :

Papers read before the Society :

The Chamber of Bridges. T. M. Cleeman.

The Inter Oceanic Canal. W. E. Dauchy.

Bridge Pins—Their Sizes and Bearings. J. A. L. Waddell.

Rational Fractions. A. E. Besosa.

Note on Gordon's Formula on Long Columns. W. H. Burr.

The size of an Angle Block in a Howe Truss Bridge. T. M. Cleeman.

Discussion of Paper on "Braced Iron Piers." W. H. Burr.

From Wm. Rotch, Boston, Mass.:

Annual Report of the Mexican Central R'y. Co. (Ld.), year ending December 31, 1880. Boston. 1881.

Report on the Case of the Watuppa Reservoir Co. vs. The City of Fall River. Wm. Rotch, C. E., December, 1880. Fall River. 1881.

From Saxonian Society of Engineers and Architects, Leipsic :

Transactions. 2d half. 1880.

From School of Mines, Columbia College, New York :

School of Mines Quarterly. Vol. II., No. 8.

From Hon. Horatio Seymour, Jr., State Engineer and Surveyor, Albany, New York :

Prosperity of our Canals. Horatio Seymour, Jr. Albany, 1881.

From W. W. C. Sites. Jersey City, N. J.:

Annual Report of the Chief Engineer of the Department of Public Works of Jersey City, N. J. Jersey City. 1881. (2 copies.)

From Smithsonian Institution, Washington, D. C.:

Annual Report for 1879.

From Society of Engineers, Bartholomew Reed, Secretary, London :

Transactions. 1880.

From Society des Ingeniéurs Civils, Paris :

Memoires, February, 1881.

From Treasury Department, Washington :

Statistical Abstract of the United States, 1880.

Third Number. Finance, Coinage, Commerce, Immigration, Shipping, The Postal Service, Population, Railroads, Agriculture, Coal and Iron, etc.

From United States Naval Institute, Annapolis, Md.:

Proceedings Vol. VI., No. 14.

From M. M. Frhrm von Weber, Berlin:

Studie über die Wasserstrassen Schwedens. M. M. Frhrm von Weber. Berlin. 1880.

From Western Society of Engineers, L. P Morehouse, Secretary, Chicago:

Proceedings. Vol. V.

From Other Sources :

A List of Railroads, Canals and Ferries owned, leased, operated and controlled by the Pennsylvania Railroad Co. on December 31st. 1880

Arguments of Mr. E. P. Wheeler, before Assembly Committee on Cities, on Underground Telegraph Wires in Cities. New York. 1881.

Annual Report Department City Works of Brooklyn, N. Y., for 1880.

The Library Journal, Vol. VI., No. 14.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

Date of Election.

BARNES, OLIVER W.....57 Broadway, New York City, N. Y.....July 6, 1881

GLASKIN, EDWIN E.....(Elected Junior April 5, 1876,) 52 Queen Victoria Street, London, England ....May 4, 1881

SANDERSON, J. GARDNER..115 Broadway, Room 80, New York City, N. Y.....July 6, 1881

ASSOCIATE.

BRADBURY, HENRY R.....Manager Neuchatel Asphalte Co. (Ld.), 54 Astor House, New York City, N. Y. July 6, 1881

CHANGES AND CORRECTIONS.

MEMBERS.

BROWN, CHARLES O.. ....Civil Engineer and Contractor, 52 & 54 William Street, New York City, N. Y.

BUCK, L. L.....Central Railroad of New Jersey, 119 Liberty Street, New York City, N. Y.

CHITTENDEN, SAMUEL H..East River, Conn.

DAVIS, CHARLES E. L. B. .Capt. Corps of Engineers U. S. A., Sabine Pass, Texas.

ENDICOTT, M. T.....Civil Engineer U. S. N., Navy Yard, League Island, Pa.

FLAGG, J. FOSTER... ....Div. Engineer Mexican National R. R., Colima, Mexico.

LATCHA, JACOB A.....Chief Engineer New York, Chicago and St. Louis R.R., 32 Board of Trade, Cleveland, Ohio.

NORTH, EDWARD P.....Chief Engineer Sinaloa and Durango R. R., Culiacan, Mexico.

SMITH, WM. SOOY.....Hudson River Tunnel, Jersey City, N. J.

SWEET, CHARLES A.....Mexican Central R. R., Durango, Mexico.

ASSOCIATE.

BELCHER, GEORGE W. C. . 2646 Washington Ave., St. Louis, Mo.

JUNIOR.

EMONTS, WILLIAM A. G. . . Huntington Valley, Bucks Co., Pa.

DEATH.

ROBERTS, W. MILNOR. . . . . (*Past President,*) Elected Member September 21, 1870. Died July 14, 1881.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. VII.—August, 1881.

NOTE.—No meetings of the Society are held in August.

CONTRIBUTIONS TO THE BUILDING FUND.

By a resolution of the Board of Direction, all contributions to the Building Fund are to be acknowledged, from time to time, by printing lists of the same in the monthly Proceedings of the Society, and in addition to this the names of all those who may subscribe $100 or more are to be regularly enrolled and published in future lists of the Society under the head of Subscribers to the Building Fund, and they will be entitled to receive one copy of the monthly publications, comprising all papers and transactions of the Society, regularly for life, for each $100 subscribed by them; such copies to be in addition to those which they may be already entitled to if they are Members or Fellows.

The following contributions up to this time are acknowledged:

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*Has subscribed double this amount.

ADDITIONS TO

LIBRARY AND MUSEUM.

From Charles L. McAlpine, New York :

Geological Report for St. Clair Railroad and Coal Company. J. P. Lesley. New York. 1855.

Annual Report of the State Engineer and Surveyor of the State of New York. Albany. 1851.

Annual Reports of the Chicago and Rock Island Railroad Company. New York. 1857 and 1859.

An Act to Incorporate the Woodstock and Lake Erie Railway and Harbor Company. Woodstock, C. W. 1852.

Documents submitted to the Galena and Chicago Union Railroad Company in relation to the Leasing of the Chicago, Fulton and Mississippi Railroad Bridge at Fulton. Chicago. 1858. (2 copies.)

Annual Report of the Baltimore and Ohio Railroad Company. Baltimore. 1859. (2 copies.)

First Annual Report of the London and Port Stanley Railway Company. London, C. W. 1854.

Articles of Agreement between the Corning and Olean Railroad Company and the New York and Erie Railroad Company.

Robert D. Silliman *vs.* The Hudson River Bridge Company at Albany ; F. W. Coleman *vs.* The same Defendant. In the Supreme Court of the United States for the Northern District of New York.

Annual Reports of the Railroad Corporations in the State of Massachusetts for 1852.

Catalogue of the Library of the Young Men's Association of Chicago. Chicago. 1856.

Annual Report of the Commissioners of the Canal Fund. Albany. 1848 and 1860.

Oswego and Syracuse Railroad. Freight Tariff. Utica. 1852.

Annual Meeting and Report of the Great Western Railroad. Hamilton, C. W. 1852 and 1853.

Report of the Hannibal and St. Joseph Railroad. Boston. 1859.

Report on Surveys for the Pictou Branch Railway, with some Remarks on the Trunk Line. James Laurie. Halifax. 1860.

Annual Report of the Department of the City of Baltimore to the Mayor and the City of Baltimore. Baltimore. 1860.

Report of the Pacific Railroad. San Francisco. 1866.

Report of the New York and Erie Railroad. New York. 1856.

A Memoir upon Stephenson's Silver Mine. J. M. Sprague. Albany. 1858.

Address to the Government of the United States upon the Merits of Pirsson's Patent Steam Condenser. Washington. 1860.

Statement of the Trustees and the Scientific Council of the Dudley Observatory. Albany. 1858.

Report on the Position of the Prospect Hill Engine House. New York. 1858.

Annual Report of the Board of Water Commissioners of the City of Detroit. Detroit. 1856 and 1857. (3 copies.)

Report of the Water Board of Georgetown, D. C. Washington, D. C. 1860.

Report and Plan of Sewerage of the City of Chicago. Chicago. 1855. (2 copies.)

Report of the Engineer to the Commissioners of Sewerage of the City of Brooklyn. Brooklyn. 1859.

Annual Review of the Trade and Commerce of the City of Chicago. Chicago, Ill. 1859.

The Cleveland *Herald's* First Annual Statement of the Trade and Commerce of Cleveland for 1858.

Report upon a Water Supply for the City of Baltimore. Baltimore. 1854.

Report of the Water Commissioners of the City of Albany. Albany. 1850. (2 copies.)

Report of the Engineers to the Commissioners of Drainage of the City of Brooklyn. Brooklyn. 1857.

Map of the Mississippi and Rock River Junction and Lyons Iowa Central Railroad.

Military Reconnaissance of the Arkansas, Rio del Norte and Rio Gila. W. H. Emory. 1847.

Rates of Toll per 100 pounds of the New York and Erie Railroad. May, 1857.

Plan of the Grand Junction Railroad. 1848.

Map of the various Channels for Conveying the Trade of the North-west. 1852.

From Isaac Newton, New York :

Proceedings of the Baltimore Meeting of the American Institute of Mining Engineers. February, 1879.

The American Bloomary Process for Making Iron direct from the Ore. T. Egleston.

New Determination of the Coefficients of Friction and Lubricated Journals, and on the Laws Governing such Friction. R. H. Thurston.

Notes on the Result of an Experiment with the Wheeler Process of Combining Iron and Steel in the Head of a Rail. W. E. C. Coxe.

Experiments on the Removal of Carbon Silicon and Phosphorus from Pig Iron by Alkaline Carbonates. T. M. Drown.

The Mesozoic Formation in Virginia. O. J. Heinrich.

Improved Pipe and Tenyere. J. H. Hartman.

The Wheeler Process for Welding Iron and Steel without the use of Fluxes. D. Torrey.

The Chemical Composition and Physical Properties of Steel Rails. C. B. Dudley.

Thin Plates of Metal. T. Egleston.

Does the Wearing Power of Steel Rails increase with the hardness of the Steel. C. B. Dudley.

The Production of Charcoal for Iron Works. J. Birkinbine.

Note on a Deposit of Cadmia in a Coke Furnace. H. Firmstone.

The New River Coal Field of West Virginia. F. S. Morris.

An Improved Universal Suspended Hydraulic Lift. J. A. Herrick.

The Manufacture of Soda by the Amonia Process. O. J. Heinrich.

The Jenks Corundum Mine, Macon County, N. C. R. W. Raymond.

A Catalogue of Official Reports upon Geological Surveys of the U. S. and Territories and of British North America. F. Prime, Jr.

Note on the Defreest Journal-Bearing. J. C. Platt, Jr.
The Law of Fatigue and Refreshment of Metals. T. Egleston.
The Tessie Gas Producer. A. L. Holley.
Accidents in the Comstock Mines, and their Relation to Deep Mining. J. A. Church.
On the use of determining Slag Densities in Smelting. T. Macfarlane.
The Mechanical Work Performed in Heating the Blast. Prof. P. W. Frazier.
The Heat of the Comstock Mines. J. A. Church.
Proceedings of the Meeting of the American Inst. Mining Engineers, at Lake George and Lake Champlain.
On some Curious Phenomena observed in making a Test of a Piece of Bessemer Steel. Wm. Kent.
Proceedings of the Pittsburgh Meeting of the American Inst. Mining Engineers.
Note on the Wear of an Iron Rail. E. C. Coxe.
The U. S. Testing Machine at Watertown Arsenal. A. L. Holley.
The Antimony Deposits of Arkansas. C. E. Wait.
The Working of Three Hearths at the Cedar Point Furnace, Port Henry, N. Y. T. F. Witherbee.
On the Apparatus for Testing the Resistance of Metals to Repeated Shocks. Wm. Kent.
Pittsburgh—Its Resources and Surroundings. Wm. P. Shinn.
Sketches of the New Mining District at Sullivan, Maine. C. W. Kempton.
Regenerative Stores—A Sketch on their History and Notes on their Use. J. M. Hartman.
The Coal and Iron of the Hocking Valley, Ohio. T. S. Hunt.
Discussion of Dr. C. B. Dudley's Papers on Steel Rails, read at the Lake George Meeting, October, 1877.
A New Method of Dredging, Applicable to some kind of Mining Operations. R. W. Raymond.
The Nickel Ores of Oreford, Quebec, Canada. E. C. Eustis.
Notes upon the Drainage of a Flooded Ore pit at Pine Grove Furnace, Pa. John Birkinbine.
Manganese Pig. Dr. R. W. Raymond.
On The Manufacture of Artificial Fuel at Port Richmond, Philadelphia. E. F. Loiseau.
A Method of Rolling Steel or Iron Eye Bars. Chas. Macdonald.
The Pernot Furnace. A. L. Holley.
The Fire-Clays and Associated Plastic Clays Kaolins, Feldspars and Fire Sands of New Jersey. Prof. J. C. Smock.
The Economy Effected by the use of Red Charcoal. B. Fernow.
Note upon the Cost of Construction of the Converting Works at the Edgar Thompson Steel Company of Pittsburgh, Pa. P. Barnes.
On the Use of Red Charcoal in the Blast Furnace. Wm. Kent.
A New Air Compressor. E. G. Spilsbury.
The Late Operations on the Mariposa Estate. C M. Rolker.
The Strength of Wrought Iron as Affected by its Composition and by its Reduction in Rolling A. L. Holley.
The Manhattan Salt Mine, at Godrich, Canada. O. J. Heinrich.
Fluxing Silicious Iron Ores. T. F. Witherbee.
Memorandum Relating to the Construction Account of the Rail Mill of the Edgar Thompson Steel Company, Pittsburgh, Pa. P. Barnes.
A New Method of taking Blast Furnace Sections. T. F. Witherbee.
Memoranda showing the Percentage of the Different Expense Accounts in Mining Hematite Ore at the Manhattan Mine, Sharon Station, New York. F. J. Lewis.
Improvements in the Appliances for Venting Molten Steel or Iron from a Casting-Ladle or Shoe. J. A. Herrick.
New Steam Engine Indicator. J. E. Sweet.
Phosphorus in Coal. Andrew S. McCreath.
Note on the Determination of Silicon in Pig Iron and Steel. Dr. T. M. Drown.
Experiments with Charcoal, Coke and Anthracite, in the Pine Grove Furnace, Pa. John Birkinbine.
Relation of Sulphur in Coal and Coke. Dr. J. B. Kimball.
On the Classification of Original Rocks. T. Macfarlane.
Notes on the Zinc Deposits of Southern Missouri. R. W. Raymond.
A Direct Process of Copper Smelting. H. M. Howe.
Washing Phosphoric Pig Iron for the Open-Hearth and Puddling Processes, at Krupp's Works, Essen. A. L. Holley.
The Hygiene of Mines. R. W. Raymond.
Proceedings of the Montreal Meeting, of the American Inst. Mining Engineers, September, 1879
The Cost of Milling Silver Ores in Utah and Nevada. R. P. Rothwell.
Recent Improvements in Concentration and Amalgamation. J. E. Church.
An Autographic Transmitting Dynamometer. Wm. Kent.
Silver Islet. T. MacFarlane.
The Humboldt-Pocahontas Vein, Rosita, Colorado. R. N. Clark.
The Great Blast at Glendon. E. Clark, Jr.
The Lake Superior Copper Rocks in Pennsylvania. J. F. Blandy.
The Bradford Oil District of Pennsylvania. Chs. A. Ashburner.
An Improved System of Cornish Pitwork. E. Dagget.
Annual Report of the Engineer and Surveyor of the State of New York, of the Railroad Corporations.
Returns of the Railroad Corporations in Massachusetts. 1866.
Fourth and Fifth Annual Reports of the Board of Railroad Commissioners of Massachusetts.
Second Annual Report of the Board of Health of the City of New York.
Sixteenth Annual Report of the Chamber of Commerce of the State of New York.
Public Papers of John T. Hoffman, Governor of New York.
Message of the President of the United States and Accompanying Documents, to the Two Houses of Congress, at the Commencement of the First Session of the Thirty-eighth Congress.
Annual Report of the Commissioners of Patents for the Year 1867.
Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains. R. W. Raymond.

Historical View of the Art of Electro-Magnetic Telegraphing in connection with the Telegraph Cable and its insulation by Gutta Percha.
Argument of Franklin B. Gowan, Esq.. before the Joint Committee of the Legislature of Pennsylvania.
Transactions of the American Philosophical Society. Vol. XII. Part III.
The Imperial Cyclopædia of Machinery.
The Woodruff Scientific Expedition Around the World. 1877-9.
The Empire of Brazil at the Universal Exhibition of 1876, in Philadelphia.
Catalogue of the Officers and Students of Columbia College. 1869-1870. 1876-77.
Catalogue of Columbia College School of Mines. 1868-69.
Catalogue of Columbia Academic Department. 1872-73.
Sixteenth Annual Register of the Free Academy of the City of New York.
Seventeenth Annual Register oi the Free Academy of the City of New York.
Twenty-second Annual Register of the College of the City of New York.
Merit Roll of the New York Free Academy, First Academic Term.
Oration and Poem Delivered Before the Associate Alumni of the College of the City of New York.
Address of the Associate Alumni of the Board of Trustees of the College of the City of New York.
Historical Cabinet of the College of the City of New York.
Thirty-fifth Annual Catalogue of the Officers, Faculty and Students of the University of Notre Dame, Indiana.
Catalogue of the Officers and Students of Lafayette College. 1871-72. 1872-73.
Annual Catalogue of the Officers and Students of Hamilton College. 1872-73.
Charter, Constitution and By-Laws of the Lyceum of Natural History in the City of New York.
By-Laws of the Lyceum of Natural History of the City of New York.
List of Officers, Honorary Members, Members and Associates of the American Chemical Society.
Silver as a Commodity, as Money and as a Material for Token Coins or Fractional Currency. Hon. Wm. D. Kelley.
Royal College of Science for Ireland. Syllabus of a Course of Lectures on Botany.
Science and Art Department, Royal College of Science for Ireland. Programme of the Educational Arrangements. 1870-71.
Annual Report of the Chief Engineers U. S. A. for 1875. Parts I and II.
The Legislative Manual of the State of New York for 1861.
The Correlation and Conservation of Forces. A Series of Expositions. Edited by Edward L. Youmans.
Davies' Surveying. New York. 1841.
The Marine Steam-Engine. Thos. J. Main and Thos. Brown.
An Elementary Course of Civil Engineering. D. H. Mahan.

From R. E. Peary, Washington, D. C.

Message from the President of the United States in response to Senate Resolution of February 11, 1880. Covering report of Secretary of State; with accompanying documents in relation to the proposed Inter-oceanic Canal between the Atlantic and Pacific Oceans.
Message from the President of the United States, transmitting copies of correspondence in relation to the Inter-oceanic Canal. March, 1881.
Letter from the Secretary of the Navy, with the report of Rear-Admiral Davis on Inter-oceanic Communication at the American Isthmus.
Speech of Hon. Wm. Windom, of Minn., in the Senate of the United States, on Isthmus Ship Canals, February 28, 1881. Washington, 1881.
Report oi Mr. King, from the Committee on Inter-oceanic Ship Canal. February, 1881, on Inter-oceanic Ship Railway.
Report of Mr. Oscar Sumer, from the Select Committee on Inter-oceanic Ship Canal, submitted February 17, 1881, on Tehuantepec Ship Railway.
Review of Capt. Phelps' Pamphlet, entitled Transportation Ships on Railways. Capt. Jas. B. Eads.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

	Date of Election.
ATWOOD, WILLIAM H.....Res. Engineer, New York, Lake Erie and Western R.R., Jersey City, N. J.....	May 4, 1881
BLICKENSDERFER, ROBERT. Div. Engineer Utah and Northern Railway, Terminus, Montana.....	June 1, 1881
MAY, WILLIAM A.....Box 173, Scranton, Pa.....	July 6, 1881
WELLINGTON, ARTHUR M. Locating Engineer Mexican National Railroad, Mexico, Mex.....	May 4, 1881

JUNIOR.

STEWART, HUNTER.....2828 Washington Ave., St. Louis, Mo.....June 1, 1881

CHANGES AND CORRECTIONS.

MEMBERS.

BECKER, M. J.....Chief Engineer P., C. & St. L. R.R., Pittsburg, Pa.
BRUNER, D. P.....P. O. Box 4, Allegheny City, Pa.
CHESBROUGH, E. S.....Dept. Public Works, 31 Chambers St., New York City, N. Y.
CORTHELL, E. L.....Chief Engineer N. Y., W. S. & B. R.R., 20 Nassau St., New York City, N. Y.
ELLIS, N. W.....Box 53, Manchester, N. H.
GARDNER, G. CLINTON....Gen. Man. Mexican National R.R., 47 William St., New York City, N. Y.
HARDING, HENRY.....Maverick House, East Boston, Mass.
HARRIS, WILLIAM P.....Supt. N. Y. & G. L. R.R., Jersey City, N. J.
LEHNARTZ, F. H.....(Stockder & Lehnartz), Lake City, Col.
LEVERICH, G.....Box 174, South Orange, N. J.
MCKEE, CHARLES H.....D. & H. C. Co. R.R., French Mountain, N. Y.
MCLAIN, LOUIS R.....Div. Engineer G. & P. R.R., Oxford, Ala.
PAINE, CHARLES.....Gen. Man. N. Y., W. S. & B. R.R., 20 Nassau St., New York City, N. Y.
STANTON, ROBERT P.....Div. Engineer U. P. R.R., Union Depot, Denver, Col.

ASSOCIATE.

HARRIS, CHARLES M.....Care Parsons & Co., 42 Pine St., New York City, N. Y.

JUNIORS.

BROOKS, FREDK.....Mexican Central Railway, Tampico, Mex.
BUTTS, EDWARD.....P. O. Box L, Kansas City, Mo.
HORTON, SANFORD.....48 Carroll St., Poughkeepsie, N. Y.
LUCAS, D. JONES.....Corry, Pa.
RAYMOND, CHAS. WARD..269 West Eleventh St., New York City, N. Y.

DEATHS.

RENO, JAMES H.....Elected Member, Nov. 5, 1879. Died Aug. 5, 1881
FARGO, WILLIAM G..... " Fellow, May 6, 1870. " " 4, 1881

American Society of Civil Engineers.

PROCEEDINGS.

Vol. VII.—September, 1881.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

SEPTEMBER 7TH, 1881.—The Society met at 8 P. M., Director William H. Paine in the chair. Ballots were canvassed, and the following candidates declared elected:—As members, Charles Blackwell, Ottawa, Canada; Walter A. Doane, Meadville, Pa.; Robert L. Engle, Cincinnati, Ohio; Charles Edward Goad, Montreal, Canada; Arthur Hider, St. Louis, Mo.; William Pierson Judson, Oswego, N. Y.; Louis Lesage, Montreal, Canada; Alexander Ludus Light, Quebec, Canada; Theodore H. McKenzie, Southington, Ct.; Gilbert Murdoch, St. Johns, New Brunswick, Canada; Etienne Henri Parent, Montreal, Canada; George Steele Skilton, Mexico, Mexico. As Associate, John Strathearn Hendrie, Marquette, Mich.

The death was announced of William Milnor Roberts, Past President of the Society, which occurred in Brazil, South America, July 14th, 1881; also the death of G. Thomas Hall, Member of the Society, which occurred in New York, June 2d, 1881; also the death of James H. Reno, Member of the Society, which occurred in Pittsburgh, Pa., August 5th, 1881; also the death of William G. Fargo, Fellow of the Society, which occurred in Buffalo, N. Y., August 4th, 1881. The appointment of Committees to prepare in each case a memoir for publication, was authorized.

A paper by D. McN. Stauffer, Member A. S. C. E., subject, Shaft Sinking under difficulties at Dorchester Bay Tunnel, Boston, Mass., was presented and its discussion postponed until the next meeting.

OF THE BOARD OF DIRECTION.

August 9th, 1881.—Applications were considered. Appropriations were made.

September 6th, 1881.—Applications were considered.

MEMOIRS OF DECEASED MEMBERS.

JAMES A. HAYWARD, Member A. S. C. E.

DIED AUGUST 13TH, 1880.

James A. Hayward was born in Dublin, New Hampshire, September 12th, 1849. He spent some time, when quite young, at Antioch College, Ohio, and in 1870 graduated with honor as a Civil Engineer at the University of Michigan. He was engaged in map business during a part of the time, from 1870 to 1873, in which latter year he married Miss Ida Upjohn, of Kalamazoo, Michigan. His wife and child died in 1876. In 1873 Mr. Hayward entered the United States service as U. S. Assistant Engineer on the survey of Pass Cavallo, entrance to Matagorda Bay and Channel to Indianola. In December, 1873, he was placed in charge of the portion of the survey for a canal to connect the inland waters along the Gulf of Mexico from the Mississippi River to the Rio Grandé, extending from Donaldsonville to Vermillion Bay, La.

After this survey was completed and estimates made he was employed in the U. S. Engineer office in New Orleans, at various duties, and for a short time assisted in taking cross-sections of South Pass, Mississippi River. He was thus employed until March, 1875, when he left the service and returned to Michigan. In November, 1876, he was placed in charge of the survey of a ship channel through Galveston Bay and was afterwards continued in the government employ in charge of the surveys of Sabine Pass, Texas, and as inspector of dredging at the mouth of the Neches River. He was accidentally drowned from the schooner Amadeo, August 12th, 1880, upon which vessel he was making a trip down the west coast of the Gulf of Mexico.

Mr. Hayward leaves a widowed mother and a sister. His professional life had been confined to the duties connected with the United States Engineer service, and his early death has cut off a member of the profession who gave great promise of enlarged usefulness in the future had his life been spared. Mr. Hayward was devoted to his family, and will be remembered as a most amiable and interesting man. He became a member of the American Society of Civil Engineers September 5th, 1877.

WILLIAM HENRY GREENWOOD, Member A. S. C. E.

DIED AUGUST 29TH, 1880.

William Henry Greenwood was born in Dublin, New Hampshire March 27, 1832. His family removed to Marlborough, in the same state, in 1834, and he received his earlier education in the public schools of that place. As a boy he showed a great fondness for machinery and seemed to have inherited from his father considerable inventive genius. Quite early in life he determined to become a Civil Engineer and entered Norwich University in 1850, graduating in 1852. Directly after his graduation he was engaged upon the Central Military Tract Railroad, now the Chicago, Burlington and Quincy. He was afterwards connected with what was then known as the American Central Railroad and continued there until the commencement of the late war.

He enlisted on the 17th day of January, 1862, in the 51st regiment of Illinois Volunteers and was commissioned First Lieutenant, to date from his enlistment. He became Captain, May 9th, 1863, in the same regiment. Soon after the battle of Stone River Gen. Rosencranz selected Captain Greenwood to organize a topographical engineer service, and directed him to report, for better facilities for the observation of the country, to Gen. Stanley, at that time in command of the Cavalry of the Army of the Cumberland. As Lieutenant-Colonel and Inspector he continued with the 4th Corps of the Army of the Cumberland to the close of the war, and Gen Stanley states that no officer was present and participated in more battles, actions, affairs and skirmishes than Colonel Greenwood. He was entrusted with constant, difficult and delicate duties. He constructed a very large amount of field fortifications, and was especially known as one of the most indefatigable and enterprising officers of the corps. He was habitually careless as to his own safety. In 1865, still in the service of the government, he rebuilt the Gulf and San Antonia Railroad in Texas, which had been destroyed. After a short visit to his home he entered the service of the Kansas Pacific Railroad, of which he was appointed Chief Engineer in 1867, and while holding this position made surveys on the 32d and 35th parallels to the Pacific Coast. Under his direction some of the most rapid known railroad construction was accomplished. Upon completion of this road to Denver, in the summer of 1870, he resigned his position as Chief Engineer, and was soon afterwards appointed General Manager of the Denver and Rio Grande Railroad Company, and occupied that position until, the road was completed to Pueblo and Cañon City. Resigning this position he returned to the East in December, 1874, and spent all of the year 1875 in Vermont. He resided in Philadelphia during the year 1876, and in Vermont in 1877, engaged professionally only upon some minor

railroad operations. In May, 1878, he took charge of the construction of the railroad now operated by the Denver and Rio Grande Company through the Grand Cañon of the Arkansas and further west toward Leadville, to which work he devoted very remarkable energy and ability. During 1879 he was in charge of the construction of the Marion and MacPherson Railroad in Kansas. He left New York on the 19th day of May, 1880, for Mexico, and arrived in the City of Mexico on the last day of the month, where he directly took charge, as Chief Engineer, of the surveys for the Mexican National Railway under the control of Messrs. Sullivan and Palmer. Up to the end of August preliminary lines had been surveyed and location made between the City of Mexico and Toluca, distant about 44 miles, together with some extensions beyond that point.

On Sunday, August 29th, 1880, the camp of Colonel Greenwood and his party was near Toluca. He, with an assistant and a servant, started toward the City of Mexico, and had proceeded to within about 15 miles of that city when the assistant and the boy left the Colonel temporarily, but found upon following him that he had ridden quite a distance ahead. He was followed rapidly, but after crossing a deep ravine at a small mill at the top of a plateau on the Mexican side, his dead body was found lying in the trail with a bullet hole through the left hand which also passed entirely through the body. He was also wounded upon the right wrist and slightly upon the head. His horse and arms were missing, but his watch, money and some valuable papers were untouched. The murder of Colonel Greenwood excited intense indignation and grief in the City of Mexico. His funeral was very largely attended and he was buried at the American cemetery, in Mexico.

Colonel Greenwood leaves a widow who had been his constant companion, not only at his home in Vermont, but also in the frontier towns where so large a part of his engineering life had been spent. She went with him to Mexico and was there at the time of his death.

All the associates of Colonel Greenwood for many years past unite in speaking of him with a personal affection and a regard for his professional ability which could only be inspired by remarkable characteristics both of the man and the engineer. Removed at a comparative early age, and in the prime of life, and in active exercise of important engineering duties, he will be remembered by those who knew him as one of the finest examples of the life and service of the American Railroad Civil Engineer. The very activity and constancy of his professional work, kept him in the extreme advance and he was therefore, not personally, known to so many members of the profession and of the society as if more of his time had been spent in larger cities and among other engineers.

He became a member of the American Society of Civil Engineers on March 3d, 1880, and was deeply interested in its objects and progress.

CHARLES A. TASKER, Junior Member A. S. C. E.

DIED OCTOBER 4TH 1879.

Charles A. Tasker was a graduate of the English High School, Boston, Mass., and commenced the practice of Civil Engineering in 1869, at South Boston. In 1870, he was engaged upon the Quincy, Missouri and Pacific Railroad, and afterwards upon the Memphis and St. Louis Railroad. In 1871, he became Assistant Engineer on the Cairo and Fulton Railroad, of Arkansas, where he remained until 1874 when he became connected with the Cincinnati Southern Railway. He was afterwards engaged upon the extension of the Atchison, Topeka and Santa Fè Railroad in New Mexico, where he had charge of the construction of bridges, etc. During the year 1879 he was engaged in the construction of the New York and Woodhaven Railroad, on Long Island, near New York City, which position he held at the time of his death.

Mr. Tasker secured the sincerest regard and respect for his abilities from the gentlemen with whom he was connected during the construction of this latter work, and the editor regrets his inability to obtain more detailed information with respect to the life of this deceased member.

Mr. Tasker joined the American Society of Civil Engineers, November 4th, 1874.

ADDITIONS TO

LIBRARY AND MUSEUM.

From John W. Bacon, Danbury, Conn.:

Twenty-Eighth Annual Report of the Railroad Commissioners of the State of Connecticut.

Ninth Annual Report of the Railroad and Warehouse Commission of Illinois, year ending Nov. 30, 1879.

Third Annual Report of the Board of Railroad Commissioners of Iowa, for year ending June 30, 1880.

Report of the Railroad Commissioners of the State of Maine, for the year 1880.

Fifth and Sixth Annual Reports of the Railroad Commissioners of Missouri, for the years 1879 and 1880.

Seventh Annual Report of the Railroad Commissioners of Wisconsin. Madison. 1881.

From H. Stanley Goodwin, Bethlehem, Pa.:

Report of the President and Directors of the Atlantic and Gulf Railroad Company, for 1876 and 1877.

Annual Reports of the Baltimore and Ohio Railroad Company. Baltimore, 1856, 1858.

Annual Reports of the Galena and Chicago Union Railroad Company, for 1858, 1860, 1861, 1862.

Annual Reports of the Grand Rapids and Indiana Railroad Company, for 1868, 1869, 1870.

Proceedings of the Ninth Annual Meeting of the Delaware Railroad Company. Dover, Del. 1861.

Report of the New Jersey Railroad and Transportation Company. John P. Jackson. Newark, N. J. 1858.

Annual Report of the Kansas Pacific Railway Company. St. Louis. 1873.

Reports and Exhibits of the Mobile and Ohio Railroad Company. December 31, 1875.

An Exhibit of the Condition of Affairs of the Grand Rapids and Indiana Railroad Company. Fort Wayne, Ind. 1866.

The Union Pacific Railroad, Omaha to the Mountains. Chicago. 1868.

Report of the North Missouri Railroad. W. Milnor Roberts. Philadelphia. 1866.

Annual Report of the Michigan Southern and Northern Indiana Railroad Company. March 1, 1868.

Report of the Directors of the Chicago, Burlington and Quincy Railroad Company. Presented to the Stockholders at the Annual Meeting, June 20, 1862. Chicago.

Twenty-Fifth Annual Report of the Board of Directors of the North Pennsylvania Railroad Company. January 14, 1878. Philadelphia.

Report of the President and Directors of the Morris Canal and Banking Company. April, 1867. Jersey City.

Annual Report of the Board of Directors of the Lehigh Valley Railroad Company. Philadelphia, 1869, 1870, 1871, 1872, 1873, 1874, 1878, 1881.

By-Laws, Articles of Association, Manufacturing Law, etc., of the West Branch, Coal, Iron Ore, and Lumber Company. May 14, 1864.

Report of the Cleveland and Mahoning Railroad. January, 1861, 1863.

Annual Report of the Directors of the Boston and Worcester Railroad Corporation, for 1857, 1858, 1859.

Annual Report of the Louisville, Cincinnati and Lexington Railroads. June 30, 1867. Louisville, Ky.

Annual Report of the President and Directors of the Louisville and Frankfort R. R. Co. Sept. 4, 1866. Louisville, Ky.

Annual Report of the President and Directors of the Virginia Central Railroad Company. Nov. 28, 1867. Richmond.

From Institution of Civil Engineers, London.

Scarborough Harbor Improvement. John Hawkins.

The Paroy Reservoir. William Bell Dawson.

The Use of Cellular Caissons. Charles Andrews.

The Empress Bridge over the Sutlej. James Richard Bell.

Explosions of Firedamp. Prof. Haton de la Goupilliére.

Portland Cement Compo and Concrete at the Garvel Dock Works, Greenock. Walter Robert Kinipple.

Dredging on the Lower Danube. Charles Henry Leopold Kühl.

The Protective Works for Preventing the Threatened Outbreak of the South Rangitata River, N. Z. John Henry Lowe.

Imperial Government Railways of Japan. The Osakayama Tunnel, Otzu, Lake Biwa. Thomas Manson Rymer-Jones.

The Flow of the River Thames. John Taylor.

Note on the Friction of Timber Piles in Clay. Arthur Cameron Hurtzig.

From Thomas H. Loomis, Culiacan, Mexico:

Erie Railway Accounts. The True and False. Fact *vs.* Fiction. President P. H. Watson's Oaths contrasted with his assertions. 1874.

New York, Lake Erie and Western R. R., Reports of the Directors. Sept. 39, 1879–1880.

Annual Meeting of the Stockholders and the 7th and 12th Annual Reports of the Directors of the Pittsburgh, Cincinnati and St. Louis R. R. Co. March 16, 1875–1880.

Fifty-fourth Annual Report of the President and Directors of the Baltimore and Ohio R. R. Co., year ending Sept. 30, 1880.

Fifth Annual Report of the Kentucky Central R. R. Co. May 25, 1880.

Report of the President and Managers of the Phila. and Reading R. R. Co. Jan. 13, 1878.

Twenty-eighth Annual Report of the Directors of the Penna. R. R. Co. March 9, 1875.

Ninth Annual Report of the Commissioner of Railroads and Telegraphs of Ohio. June 30, 1875. Columbus.

Special Report of the Commissioner of Railroads and Telegraphs. Columbus. 1881.

Report of the Commission on Affairs of the Trustees of the Cincinnati Southern R. R. Jan. 14, 1879. Cincinnati.

From Edward P. North, New York:

The World's Navigation. The Problem of River Mouths. W. P. Stackpole. Bloomington, Ill. 1879.

Report of Commissioners for Testing the Chicago West-side Pumping Engines. (M. Lane, Chas. H. Haswell, Henry Warrington, Commissioners.) Chicago. 1877.

An Address delivered before the Alumni Association of the Lehigh University. E. B. Coxe. Philadelphia. 1878.

Annual Report of the Nassau Water Department. Brooklyn, 1872.

History of Steam Navigation between New York and Providence. Chas. H. Dow. New York, 1877.

Communication from the Landscape Architect and Civil and Topographical Engineer, in relation to the Proposed Plan for Laying Out the Central District of the Twenty-third and Twenty-fourth Wards, Department of Public Parks, lying east of Jerome Avenue and west of Third Avenue and Harlem Railroad. F. L. Olmsted. J. J. R. Croes. 1877.

I. Preliminary Report of the Landscape Architect and the Civil and Topographical Engineer upon the laying out of the Twenty-third and Twenty-fourth Wards.

II. Report of the Landscape Architect and the Civil and Topographical Engineer, accompanying a plan for laying out that part of the Twenty-fourth Ward lying west of Riverdale Road. F. L. Olmsted. J. J. R. Croes. 1876.

From T. Guilford Smith, Buffalo, N. Y.:

A Discussion of the General Principle Involved in the Construction and Action of the Isometrical Truss Bridge. Charles Macdonald. Philadelphia. 1867.

Discussion on Joints of Railways. From the Journal of the Franklin Institute for July, 1857.

McCallum's Inflexible Arched Truss Bridge, D. C. McCallum. New York. 1859.

The Philadelphia and Erie R. R. Co. *et al. vs.* The Catawissa R. R. Co. *et al.*, and Andrew Scott *vs.* The Atalantic and Great Western R'y Co. *et al.* In the Supreme Court of Pensylvannia, Eastern District. January Term, 1864. Arguments for Defendants.

Annual Report of the Commissioners on the Troy and Greenfield R. R. and Hoosac Tunnel. Boston. 1867.

Sur le percement du grand tunnel des Alpes. M. Conte.

Notes on Polytechnic or Scientific Schools in the United States. S. E. Warren. New York. 1866.

Agreement between the Atlantic and Great Western Railway Company and the Philadelphia and Reading Railroad Company. Philadelphia. 1866.

The Philadelphia and Erie Railroad Co. *et al. vs.* the Catawissa Railroad Co. and others. In the Supreme Court of Pennsylvania in and for the Eastern District. Affidavits for Defendants. January, 1866.

The Philadelphia & Erie R. R. Co. *et al. vs.* The Catawissa R. R. Co. *et al.*, Andrew Scott *against* The Atlantic and Great Western R'y Co. *et al.* In the Supreme Court of Pennsylvania, Eastern District. January, 1866. Opinion of Court and Decree.

The Junction Railroad Company *vs.* The Pennsylvania Railroad Co. and J. Edgar Thomson. President of said Company. In the Supreme Court of Pennsylvania, Eastern District. In Equity. (2 copies.)

Act of Incorporation of the Mahony and Broad Mountain Railroad Company. Philadelphia. 1861.

Report of the Board of Managers of the Mine Hill and Schuylkill Haven Railroad Company. Philadelphia. 1861.

List of officers and Directors and Act of Incorporation of the Bethlehem Railroad Company. 1862.

Annual Report of the Pittsburgh, Titusville and Buffalo Railway Co. Philadelphia, 1880.

Report of the President and Managers of the Philadelphia and Reading Railroad Co. Philadelphia. 1855, 1862, 1863, 1864 (2 copies), 1866 and 1867.

A Problem in Practical Surveying: Demonstrated by means of Transversals. W. M. Gillespie. March, 1857.

Tracing of the West Branch Bridge, P. R. R, J. Dutton Steele, C. E.

Tracing of Peacock's Lock Bridge. J. Dutton Steele, C. E.

Tracings of Third Crossing Bridge. P. & R. R. R. J. Dutton Steele, C. E.

Tracings of Sanatoga Bridge. J. Dutton Steele, C. E.

Profiles of the Canals and Railroads for Transporting Anthracite Coal from the several Coal Fields to the City of New York. J. Dutton Steele. 1857.

From D. Van Nostrand, New York:

The Aneroid Barometer; its Construction and Use. Van Nostrand's Science Series. No. 35. New York. 1878.

Geographical Surveying; its Uses, Methods and Results. Frank de Yeaux Carpenter, C. E. Van Nostrand's Science Series. No. 37. New York. 1878.

Maximum Stresses in Framed Bridges. Prof. Wm. Cain, A. M. C. E. Van Nostrand's Science Series. No. 38. New York. 1878.

Voussoir Arches applied to Stone Bridges, Tunnels, Domes and Groined Arches. Wm. Cain, C. E. Van Nostrand's Science Series. No. 42. New York. 1879.

Turbine Wheels. Prof. W. P. Trowbridge. Van Nostrand's Science Series. No. 44. New York. 1879.

Linkages: the Different Forms and Uses of Articulated Links. J. D. C. De Roos. Van Nostrand's Science Series. No. 47. New York, 1879,

Theory of Solid and Braced Elastic Arches, Applied to Arched Bridges and Roofs in Iron, Wood, Concrete, or other Materials. Wm. Cain, C. E. Van Nostrand's Science Series. No. 48. New York. 1879.

Dwelling Houses: their Sanitary Construction and Arrangements. Prof. W. H, Corfield, M. A., M. D. Van Nostrand's Science Series. No. 50. New York. 1880.

Four Lectures on Electric Induction. F. E. H. Gordon, Royal Institution. New York. 1881.

Manual of Hydraulic Mining, for the use of the Practical Miner. S. F. Van Wagenen, E. M. New York. 1880.

Electric Lighting by Incandescence, and its Application to Interior Illumination. W. E. Sawyer. New York. 1881.

Sewers and Drains for Populous Districts with Rules and Formulæ for the Determinationsof their Dimensions under all Circumstances. J. W. Adams. New York. 1880.

A Guide to the Determination of Rocks, being an Introduction to Lithology. Edouard Jannettas. Translated from French by Geo. W. Plympton, C. E. A. M. New York. 1877.

Researches in Graphical Statics. Henry P. Eddy, C. E., PH. D. New York. 1878.

A Treatise on the Principles and Practice of Levelling. F. W. Simms. New York. 1876.

The Use of Steel. J. Barba and A. L. Holley. New York. 1875.

Earthwork Mensuration, on the Basis of the Prismoidal Formula. C. R. Howard. New York. 1874.

A Manual of Heating and Ventilation. F. Schumann. New York. 1877.

Skeleton Structures, of Steel and Iron Bridges. Olans Henrici. New York. 1867.

A Treatise on Accounts, in Connection with Ventilation. A. Saeltzer. New York. 1872.

A Practical Treatise on Roads, Streets and Pavements. Gen. Q. A. Gillmore. New York. 1876.

Weights and Measures According to the Decimal System. B. F. Craig. New York. 1876.

Engineers, Contractors and Surveyors' Pocket Table Book. J. M. Scribner. New York. 1878.

A Treatise on Engineering Construction. J. E. Shields. New York. 1877.

On the Construction of Iron Roofs. Francis Campin. New York. 1868.

A Treatise on the Method of Government Surveying. S. V. Clevenger. New York. 1877.

The Plane Table and its use in Topographical Surveying. From the Papers of the U. S. Coast Survey. New York. 1869.

American and European Railway Practice in the Economical Generation of Steam. A. L. Holley. New York and London. 1867.

The Naval Dry Docks of the United States. C. B. Stuart. New York and London. 1870.

On the Use of the Barometer on Surveys and Reconnaissances. New York and London. 1868.

Iron Truss Bridges for Railroads. Methods of Calculating Strains, with a Comparison of the most Prominent Truss Bridges, and New Formulas for Bridge Computations. Col. W. E. Merrill. New York. 1875.

Lives and Works of Civil and Military Engineers of America. C. B. Stuart. New York. 1871.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

	Date of Election.
DOANE, WALTER A.....Chief Engineer Meadville Railway, Meadville, Pa.....	Sept. 7, 1881
HIDER, ARTHUR.....Assistant U. S. Engineer, 2828 Washington Ave., St. Louis, Mo.....	" "
JUDSON, WILLIAM P.... Assistant U. S. Engineer, Oswego, N. Y...	" "
MCKENZIE, THEODORE H..Peck, Stow & Wilcox Co., Southington, Conn.....	" "
MURDOCH, GILBERT.....Chief Engineer Water Works, St. Johns, New Brunswick.....	" "

ASSOCIATE.

HENDRIE, JOHN S.....Engineer Detroit, Mackinaw and Marquette Railway, Marquette, Mich.....	" "

CHANGES AND CORRECTIONS.

MEMBER.

FIELD, GEORGE S.....Central Bridge Co., Buffalo, N. Y.

JUNIORS.

HAYES, EDMUND.....Central Bridge Co., Buffalo, N. Y.

PERKINS, CHARLES P.....Engineer Pittsburgh and Erie Division, Pennsylvania R. R., Williamsport, Pa.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. VII.—October, 1881.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

SEPTEMBER 21ST, 1881.—The Society met at 8 P. M., Vice-President Welch in the chair. A paper by D. McN. Stauffer, Member A. S. C. E., subject, Shaft Sinking under difficulties at Dorchester Bay Tunnel, Boston, Mass.; was read by the author and discussed.

OCTOBER 5TH, 1881.—The Society met at 8 P. M., William E. Worthen in the chair. Ballots were canvassed and the following candidates declared elected as members: Alfred Brittain, Montreal, Canada; Joseph R. Thomas, Brooklyn, N. Y.; John A. L. Waddell, Council Bluffs, Iowa.

The following proposed amendments to the Constitution were presented and read:

PROPOSED AMENDMENTS TO ARTICLE XXIV.

After the words "Fellowship Fund" at the end of the first line, in-

sert the words, "Ten Thousand Dollars of which shall be," so as to read: "There shall be a fund called the Fellowship Fund, ten thousand dollars of which shall be devoted exclusively to the publication of the papers read before the Society," &c. &c.,

Also add at the close of the article, the words, "Fellows shall be elected in the same manner as Honorary Members."

The above amendment is proposed by the following named members of the Society: O. Chanute, Ashbel Welch, George S. Field, Walter Katté, Charles Paine, Alf. P. Boller, F. Collingwood, W. H. Paine, C. V. Smith, Jos. P. Davis.

Proposed Amendment to Article V.

Second line by striking out the word "five" and inserting the word "ten," so that it shall read "ten Directors."

The above amendment is proposed by the following named members of the Society: W. E. Worthen, A. F. Wrotnowski, Chas. H. Haswell, O. Chanute, Jos. P. Davis.

Proposed Amendment to Article XXXIII.

Strike out the word "October" in the third line and substitute therefore the word "November."

Also strike out the word "February" in the eighth line and substitute the word "March."

The above amendment is recommended for adoption by the Board of Direction, being consequent upon the change already made in the time of the Annual Meeting, and is formally proposed by the following named members of the Society: O. Chanute, W. H. Paine, C. V. Smith, Joseph P. Davis, John Bogart.

The following proposed amendment to the By-Laws was presented and read.

Section 24, third clause, strike out the word "October" and substitute the word "November."

The above amendment is recommended for adoption by the Board of Direction on account of the change already made in the time of the Annual Meeting, and is formally proposed by the following named members of the Society: O. Chanute, W. H. Paine, C. V. Smith, Jos. P. Davis, John Bogart.

The paper by D. McN. Stauffer, Member A. S. C. E., read at the previous meeting, subject, Shaft Sinking under difficulties at the Dorchester Bay Tunnel, Boston, Mass.; was discussed by Messrs. Bogart, Joseph P. Davis, Glaskin and Chanute.

The subject of the Point of Reference for Strains was introduced by Theodore Cooper, and discussed by Messrs. Chanute, Joseph P. Davis and W. H. Paine.

MEMOIRS OF DECEASED MEMBERS.

GEORGE THOMAS HALL, Member A. S. C. E.,

DIED JUNE 2D, 1881.

George Thomas Hall was born in Malta, Saratoga County, New York, April 6, 1845. He became an Associate Member of the American Society of Civil Engineers October, 2d, 1872, and a Member, September 2d, 1874.

At an early age he manifested a fondness for study; attended the Boy's Academy at Ballston Springs, and at the age of 17 taught a large school of advanced pupils. Two years later he graduated from the Normal College at Albany, and after remaining the following year, as a teacher, he entered the sophomore class of the Rensselaer Polytechnic Institute, at Troy, New York, from which he graduated in 1868, taking the degree of Civil Engineer. Here he had the reputation of an earnest and patient student, and his genial and companionable nature made him a great favorite with his fellow students, who honored him with their choice of class orator.

Soon after completing his professional education, which was accomplished only through the persevering effort of a determined will in overcoming many obstacles of a pecuniary sort, he began service as a transitman on the New York, New Haven and Willimantic Railroad under Gen. E. W. Serrel, Chief Engineer, taking high rank and performing satisfactory service in what was regarded as an unsually excellent corps on that line.

From there he went to Canada, holding a responsible position in the construction of 180 miles of the North Shore Railroad. Money failing, this new enterprise was abandoned, when he returned to the States and took a position as chief of corps on the West Shore Railroad under Gen. Stuart.

We next find him in New York City making the first surveys for the Gilbert Elevated Railway, upon which he was engaged for some time, until its further development was suspended.

NOTE,—Committee to prepare memoir; F C. Prindle and John Bogart, Members A. S. C. E. Special acknowledgement for assistance in the preparation of this memoir is made to Wm. F. Shunk, Esq., C. E.

He was soon after appointed State Division Engineer on the Champlain Canal enlargement, and located at Whitehall, New York, where he remained for three years. He performed the responsible duties and trusts connected with this important public work with marked fidelity and ability, and was particularly zealous and watchful in the State's interests.

While here he was elected Captain of the Separate Company of the State National Guard of Whitehall, and served with great acceptance in that capacity, proving himself a most intelligent and efficient as well as popular officer, who contributed much to the excellent discipline and drill of his command.

His company was called out during the railroad riots of that period, and his command was quartered a part of the time in Troy, where he rendered efficient service by the exercise of great tact in the dispersion of riotous mobs without the necessity of resorting to extreme measures. The excellent discipline and fine bearing of Captain Hall's command under these circumstances were noteworthy.

From Whitehall he returned to New York as Division Engineer of the Elevated Railway, which position he held until his death, June 2, 1881.

Just prior to his last sickness he was offered an important position in charge of the construction of public works under the Government, at a Southern navy yard, but which he declined, preferring to retain his connection with the Elevated Railway, in the study and construction of which he was so much interested, professionally, and with which he had been so long and closely identified.

All of the valuable service rendered by Captain Hall in the prosecution of this important work will never be generally known. He had charge of the foundation work on the Second Avenue line, as well as on Eighth and Ninth avenues, and his excellent paper read before the Society April 20, 1881, shows the method of his administration and his professional ability for the place.

In connection with this work, his Chief Engineer, Mr. William F. Shunk, furnishes this tribute to his skill in the performance of the many important matters entrusted to him: "He was systematic in the conduct of his work to an extraordinary degree. His record contains a perfect history of each foundation, and answered every question put, as to material, cost and time. The same as to tracklaying. But beyond his dutiful, skilful and diligent conduct of professional duties, Captain Hall did important service for the company that employed him, unknown to them and not likely ever to be known. I refer to the stilling of complaints and the amicable settlement of claims along the line of the road, a field of effort in which he could hardly be equalled, and where his generous nature, fine courtesy, and knowledge of mankind found ample room for exercise. It would

hardly be believed how incessant was the stream of such grievances, the greater portion of them never reaching the ears of the Board. Men with vaults invaded, light intercepted, sidewalks obstructed, water stopped, drains broken, or averred to be, butchers with meat tainted from the diggings, and innumerable other troubles, all charged to the railroad.

"And in addition to the multitude really aggrieved, or believing themselves so, there was an abundance of claimants put up to mischief by a class of curbstone lawyers who prowled the street for prey. Their business was, with perjury for a basis, to erect on it, under forms of law, a bill of damages in which they took a half interest. This bedlam rout dinned our ears without ceasing, and our diplomatic captain was constantly on the go. He quieted probably half of them by considerate attention, conciliatory remonstrance and prudent reasoning.

"Such of them as survived this witchery, he so ascertained the facts of, and located the witnesses, and reported the circumstances, that counsel usually found it easy to make a cheap compromise. These things distracted him from his proper work, and it was a department of service for which, in the nature of things, he could never have credit with the Directory. But he did it cheerfully and thoroughly."

Thus was he buisily occupied, until an alarming disease laid its hand upon him, which, for four weary months, made his life one of intense suffering. Slowly consuming the strength of this true, brave man, it could not daunt his cheerful and heroic spirit which was destined to enjoy the greater triumphs of calmly contemplating his approaching end, and patiently enduring his unassuageable sufferings with the unwaverin faith and resignation of a Christian.

Of his personal worth and character many praises might be fitly sung; his eminent abilities of mind did not surpass the nobler qualities of heart and soul.

He was always a courteous gentleman, a warm and generous friend, and these noticeable characteristics combined with his winning manners, made one accept him, like any other fine make of nature, without questioning.

Peace to that great soul which we called by his name, not knowing all its greatness.

"He, being made perfect, in a short time fulfilled a long time. For though the righteous be prevented with death, yet shall he be in rest."

THE NORMAN MEDAL.

CODE OF RULES FOR ITS AWARD.

I.—Competition for the Norman Medal of the American Society of Civil Engineers shall be restricted to Members of the Society.

II.—There shall be one gold medal, and only one, struck for each and every fiscal year of the Society, and awarded as hereinafter provided. The dies therefor shall be with the Superintendent of the United States Mint at Philadelphia, in trust exclusively for the above purpose. Such Medal shall be of a cost equal to the annual interest received upon $1 000 of the Consolidated Stock of the City of New York, Certificate No. 179, of the additional new Croton Aqueduct Stock of the City of New York, authorized by an Act of the Legislature of the State of New York, Chap. 230, passed April 15th, 1870, dated November 17th, 1873, now held in trust by the Treasurer of this Society, and so held solely for this purpose, and shall be executed upon his order.

III.—All original papers presented to the Society by members of any class, during the year for which the medal is awarded, shall be open to the awards, provided that such papers shall not have been previously contributed in whole or in part to any other association, nor have appeared in print prior to their publication by the Society, nor have been presented to the Society in any previous year.

IV.—The Board of Censors to award the Medal shall consist of three members of the Society, to be designated by the Board of Direction. The Secretary of the Society shall act as Secretary to the Board of Censors.

V.—The medal shall be awarded to such paper as the said Board shall judge to be worthy of special commendation for its merits as a contribution to Engineering Science, not merely relatively as compared with others presented during the same year, but as exhibiting the science, talent or industry displayed in the consideration of the subject treated of, and for the good which may be expected to result from the discussion and the inquiry.

VI.—In case no paper presented during the year shall be deemed of sufficient value to receive an award, the amount of the interest of the fund for that year shall be expended by the Board of Direction in the purchase of books, to be offered as a premium for the second best paper in the next year in which more than one paper of sufficient value may be presented.

VII.—The medal year shall terminate on the first day of August, and the award shall be announced at the Annual Meeting.

VIII.—The Treasurer of this Society shall cause the medal to be prepared and delivered to, or deposited to the order of, the successful competitor, within two months after the Annual Meeting at which the same shall have been awarded.

ADDITIONS TO

LIBRARY AND MUSEUM.

From T. B, Blackstone, Chicago :

Ninth to the Eighteenth (Inclusive) Annual Reports of the Chicago and Alton Railroad. From 1871 to 1880.

From D. W. C. Brown, Sandusky, Ohio :

Reports to the Stockholders of the Cincinnati, Sandusky and Cleveland Railroad. From 1872 to 1880, inclusive.

From John Burton, Milwaukee, Wis. :

Reports of the Directors of the Detroit, Grand Haven and Milwaukee Railway, with Statements of Accounts, etc., for the years 1869–1870 and 1874.

Reports of C. C. Trowbridge, Receiver of the Detroit and Milwaukee Railroad. From 1875 to 1878.

Report of the Directors of the Detroit, Grand Haven and Milwaukee Railway. Detroit. 1880.

From M. M. Greene, Columbus, Ohio :

Fifth to the Twelfth Annual Reports of the Columbus and Hocking Valley Railroad. From 1873 to 1880.

First to the Fourth Annual Reports of the Columbus and Toledo Railroad. From 1877 to 1880.

From H. Keep, Chicago :

Reports of the Chicago and North Western Railroad for 1869, 1870 and 1874 to 1880.

From H. B. Ledyard, Detroit :

Annual Reports of the Directors of the Michigan Central Railroad. June, 1847, 1848, 1858, 1863, 1864. 1865, and year ending December 31. 1880. Detroit and Boston, and Circular of the Treasurer, December 26, 1855.

From Charles Paine, Cleveland :

Annual Reports of J. H. Devereux, Receiver of the Atlantic and Great Western Railroad for the years 1872, 1875 and 1876 to 1880. Cleveland.

Lake Shore and Michigan Southern Railroad. Local Freight Classification to take effect April 4, 1881. Cleveland. 1881.

Eighth Annual Report of the Railroad Commissioners of Michigan for the year ending December 31, 1879. Lansing. 1880.

New York, Pennsylvania and Ohio Railroad. Proceedings of the Meeting of Officers held at Cleveland, Ohio, March 23, 1881. Jamestown. 1881.

First Annual Report of the New York, Pennsylvania and Ohio Railroad for the year 1880.

Eleventh, Twelfth and Thirteenth Annual Reports of the Commissioner of Railroads and Telegraphs for the years ending June 30, 1877, 1878, 1879. Columbus, Ohio,

The St. Louis, Alton and Terre Haute Railroad *vs.* The Indianapolis and St. Louis, The Lake Shore and Michigan Southern, The Cleveland, Columbus, Cincinnati and Indianapolis, The Pittsburgh, Fort Wayne and Chicago, The Indianapolis, Cincinnati and Lafayette, and the Pennsylvania Railroad Companies, and the Pennsylvania Company. Case No. 6,257, Circuit Court, U. S. Indiana.

From C. E Perkins, Chicago :

Twenty-third to the Twenty-seventh Annual Reports of the Directors of the Chicago, Burlington and Quincy Railroad. From 1876 to 1880.

Reports of the Directors of the C. B. & Q. R.R. presented at the Annual Meetings, June 21, 1861, February 24, 1875, and February 23, 1876.

From H. Riddle, Chicago :

Annual Reports of the Chicago, Rock Island and Pacific Railroad for the years 1869, 1871, 1872 and 1874 to 1880.

From H. C. Potter, East Saginaw, Mich. :

Annual Reports of the Flint and Pere Marquette Railroad for the years 1867, 1869 to 1872 to 1880.

O. Prescott, W. W Craps, A. G. Pierce and P. V. Rogers, Trustees of the Flint and Pere Marquette Railroad, Complainants, *vs.* The Flint and Marquette Railroad, Defendants.

Report of H. C. Potter, Receiver. January 12, 1881.

From E. B. Thomas Cleveland :

Annual Reports of the Directors of the Cleveland, Columbus and Ohio Railroad for the years 1860, 1862, 1868, 1869 to 1873 and 1874 to 1880,

From J. F. Tucker, Chicago :

Report and Accounts of the Illinois Central Railroad for the years 1868 to 1871 to 1880.

From L. Williams, Cincinnati :

Fourth, Fifth, Sixth and Twenty-second to Thirty-third Annual Reports of the Cincinnati, Hamilton and Dayton Railroad for the years 1854, 1855, 1856 and 1869 to 1880.

From Wm. E. Worthen, New York :

Reports to the Lords of the Committee of Privy Council for Trade upon the Accidents which occurred on Railways during the years 1856, 1857 (2 copies), 1858. Capt. D. Galton, R. E. London.

Reports of the Number of Accidents and the injuries of Life and Limb which have occurred on Railways of Great Britain from July 1 to December 31, 1855. London. 1856.

Reports of the Inspecting Officers of the Railway Department upon Certain Accidents which have occurred on Railways of Great Britain during the months of August, September, October, November and December, 1855, 1857 and 1858.

Reports of the Inspecting Officers of Railway Department upon Certain Accidents which have occurred on Railways of Great Britain during the months of January, February, March and April. Part II., 1857. Parts I., II.. III. and IV., 1858 ; and Parts I., II. and IV., 1859,

Reports of the Inspecting Officers of the Railway Department of Great Britain upon Four Accidents which occurred on the South-Eastern Railway, 1855. London. 1856.

Return of the Number and Nature of the Accidents and Injuries of Life and Limb which have occurred on the Railways of Great Britain from July 1 to December 31, 1856. London. 1857.

Report of the Commissioners of Railways of Great Britain for the year 1850. London. 1851.

First, Second, Third, Fourth and Fifth Reports of the Select Committee on Railways and Canal Bills, together with Minutes and Evidence and Anpendix. December 16, 1852. February 28, 1853. March 18, 1853. April 8. 1853. July 8, 1853. London.

Returns showing the Number of Passengers conveyed on all the Railways of Great Britain, distinguished in different classes, and the Receipts from each Class of Passengers, and from Goods, Etc., Etc., during the half years ending December 31, 1856, 1857 and 1858.

Testimony taken before the Committee on Railroads in relation to the Accident which occurred on the Hudson River Railroad, at New Hamburgh, on Monday, February 6, 1871. Albany. 1871.

Report upon a Plan of Construction of several of the Principal Railroads in the Northern and Middle States, and upon a Railway Structure for a new track on the Baltimore and Ohio Railroad. J. Knight, Chief-Engineer, and Benj. H. Latrobe, Engineer of Location and Construction. Baltimore. 1838.

Report to the Stockholders of the Boston, Hartford and Erie Railroad. September 25, 1864. Hartford. 1864.

Prospectus of the New York, Housatonic and Northern Railway. New York. 1864.

Report of the Commissioners upon the Troy and Greenfield Railroad and Hoosac Tunnel. Boston. 1869.

Annual Report of the Commissioners on the Troy and Greenfield Railroad and Hoosac Tunnel. Boston. 1867.

Report of Benj H. Latrobe, Consulting Engineer, on the Troy and Greenfield Railroad and Hoosac Tunnel. Boston. 1869.

The Charters on the Leavenworth, Pawnee and Western Railway Company, and all Laws of Kansas affecting its Duties, Powers and Liabilities. New York. 1862.

Report of the Board of Directors to the Stockholders of the New York and New Haven Railroad. May 13, 1858. New York. 1858.

Report of the Executive Committee having in charge the Surveys relating to the Peekskill and Carmel Railway. Peekskill. 1860.

A Reply to the Speech of Mr. Charles Francis Adams, Jr., before the Joint Standing Committee on Railroads of the Massachusetts Legislature. R. S. Spofford. Boston. 1873.

Report on the South Pennsylvania Railroad; also, its Charter and Supplements. Harrisburgh. 1869.

Report of the Joint Standing Committee on the Troy and Greenfield Railroad and Hoosac Tunnel for the year 1858.

Grant of Lands by the United States to the State of Missouri for Railroad Purposes, and Acts passed by the Legislature affecting the Southwest Branch of the Pacific Railroad. St. Louis. 1859.

Pelteler Portable Railroad Company. New York. 1871.

Lands for Sale by the Pacific Railroad Company. St. Louis. 1859.

Metropolitan Railway Company. Half-Yearly Report. Aug. 9, 1871.

REPORT OF THE FINANCE COMMITTEE

ON THE SUBJECT OF

COMPOUNDING ANNUAL DUES BY ONE PAYMENT.

To the Board of Direction of the
American Society of Civil Engineers:

GENTLEMEN,—The Finance Committee, to which was referred the subject of a proper sum for compounding the dues of members for life, by one payment, have carefully considered the subject, and herewith present the results of their investigations and the conclusions arrived at.

The most laborious portion of these investigations has been done in a very thorough manner by Mr. Bogart, the secretary of this Society, who has compiled from the records, statements having a direct bearing

upon this subject, which are of so much practical importance and rea- interest to the Board, that we incorporate them entire, adopting them with his conclusions as a part of our report.

Mr. Bogart's report is as follows :

NEW YORK, May 9, 1881.

COL. WM. H. PAINE, *Director, A. S. C. E.,*
Chairman of Finance Committee :

DEAR SIR,—In connection with the resolution of the Board referred to the Finance Committee, as to the sum proper for compounding dues by one payment, for life, I venture to submit to the Committee some points I have gathered while considering the subject.

There has recently been submitted an amendment to the Constitution which proposes the payment of $300.00 by a resident member, and $150.00 by a non-resident member, as a compounding sum for life, with a provision that a non-resident becoming a resident, shall pay the remainder of the composition, viz., $150.00, or the usual annual subscription during the time of his residence.

The annual dues of the Society now are :

For members, resident	$25 00	Non-resident	$15 00
For associates, "	15 00	"	10 00
For juniors, "	15 00	"	10 00

The admission fees are : For members, $30 ; Associates, $20 ; Juniors, $20.

The annual dues of the Institution of Civil Engineers in England are :

For members, resident,	4 guineas.	Non-resident	3 guineas.
For associates, "	3 "	"	2½ "
For students, "	2 "	"	1½ "

The admission fee is : For members and associates, 10 guineas.

The Institution of Civil Engineers permits "any member or associate, whose subscription is not in arrears, if resident in the United Kingdom, to compound for future annual subscriptions by the payment of fifty guineas. Any member or associate residing abroad, may compound by the payment of twenty-five guineas, but should he come to reside in the United Kingdom, he shall pay the remainder of the composition,

viz., twenty-five guineas, or the usual annual subscription during such residence. All such compositions shall be invested, and the interest alone shall be appropriated to the current expenditure of the Institution, except by special direction of the council, on the report and recommendation of the Finance Committee.

The terms, resident and non-resident, are applied as regards dues, in the English Society, respectively to persons residing within ten miles of the General Post Office, in London, and to persons residing beyond those limits.

But the provision for compounding dues gives the low rate only to persons residing outside the United Kingdom; all persons residing within the United Kingdom being compelled to pay the full compounding sum of fifty guineas.

Residency, as arranged by the law of the American Society, applies to all who reside within fifty miles of the New York Post Office.

By the last report of the Board of Direction, November, 1880, the membership in the American Society was:

Resident members	114	Non-resident members	359
" Associates	6	" Associates	14
" Juniors	6	" Juniors	42
Total paying resident	126	Non-resident	415
Resident honorary members	3	Non-resident hon. members	9

Resident members	129
Non-resident members	424
Fellows, who are not members	55
Corresponding members	3
Total	611

Suppose the plan suggested be adopted, and also suppose it generally followed by members, the result would be (omitting from the calculation Associates and Juniors and also Honorary and Corresponding members who pay no dues):

114 Resident Members, paying $300 each, would give	$34 200
359 Non-resident Members, paying $150 each, would give	53 850
Or a capitalized fund of	$88 050

The highest rate of interest safe to assume as receivable on trust funds is probably 5 per cent., which, on $88 050 would give, per annum, $4 402 50.

The amount now received from the same number of members is :

114 Resident Members, at $25 each	$2 850 00
359 Non-resident Members, at $15 each	5 385 00
Total per annum	$8 235 00
If funded as above, per annum	4 402 50
Or an annual present decrease in the income of the society of	$3 832 50

or about 46½ per cent. decrease from the present income received from these members. In other words, we would only receive, per annum, about 53½ per cent. of the amount now received from these members.

Even at 6 per cent. the income would only be $88 050 at

6 per cent	$5 283 00
Present income from same members	8 235 00
Annual deficiency at 6 per cent	$2 952 00

The total income of the society from every source was last year $12 473 04, as follows :

Entrance Fees	$1 850 00
Current Dues	6 366 41
Past Dues	835 00
Advance Dues	2 246 13
Interest on funds	785 20
Other sources	390 30
Total income	$12 473 04

The loss, with the compounding payments capitalized at 5 per cent. would be a little over 30 per cent. on the total present annual income of the society.

On the other hand, it may be considered that the payments made for compounding dues become permanent investments for the society, and that if the society is able to stand the annual loss for a period of years,

it will eventually be the the gainer from the fact that as members die or resign, their dues cease, while the interest on a capitalized sum remains perpetual.

The annual *loss* of members for a series of years has been :

Year ending	Total Membership.	Loss from all causes.	Percentage of Loss.
Nov., 1873	414	6	1.45
" 1874	445	22 *	4.94
" 1875	492	8	1.63
" 1876	552	5	0.91
" 1877	574	15 †	2.61
" 1878	593	7	1.18
" 1879	601	20 †	3.32
" 1880	611	58 ‡	9.49
Averages	535.25	17.625	3.29

The average annual loss of members has thus been about 3.29 per cent. from all causes, but the dropping of 45 members for non-payment of dues in one year (1880) was unusual; without that loss of 45 members the percentage of loss would average only 2.24 per cent. per annum. Probably 3 per cent. per annum will fairly cover the loss, as far as experience shows in the past.

On the general basis of the present paying membership of the Society and on the amount which would be realized if the plan of compounding were adopted there would be, as stated above, a sum of, say, $4 400 per annum, realized from the capitalized fund, at 5 per cent.

These same members now pay, say, $8 000 per annum. This sum would be reduced 3 per cent. per annum by loss of members through death or resignation.

On this basis, and without reference to new membership, the annual income from these members for a series of years would be :

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* Fourteen dropped for non-payment of dues.
† Ten deceased.
‡ Forty-five dropped for non-payment of dues.

Successive Years.	Income under present system of Dues, reduced 3 per cent. each year.	Income if dues are compounded, and the amount capitalized at 5 per cent.	Income less under compounding plan than under present system.	Income more under compounding plan than under present system.
Present Year.	$8 000 00	Nothing	$8 000 00	
1	7 760 00	$4 400 00	3 360 00	
2	7 527 20	4 400 00	3 127 20	
3	7 301 38	4 400 00	2 901 38	
4	7 082 34	4 400 00	2 682 34	
5	6 869 87	4 400 00	2 469 87	
6	6 663 78	4 400 00	2 263 78	
7	6 463 87	4 400 00	2 063 87	
8	6 269 95	4 400 00	1 869 95	
9	6 081 85	4 400 00	1 681 85	
10	5 899 39	4 400 00	1 499 39	
11	5 722 41	4 400 00	1 322 41	
12	5 550 74	4 400 00	1 150 74	
13	5 384 22	4 400 00	984 22	
14	5 222 69	4 400 00	822 69	
15	5 066 01	4 400 00	666 01	
16	4 914 03	4 400 00	514 03	
17	4 766 61	4 400 00	366 61	
18	4 623 61	4 400 00	223 61	
19	4 484 90	4 400 00	84 90	
20	4 350 35	4 400 00		$49 65
21	4 219 84	4 400 00		180 16
22	4 093 24	4 400 00		306 76
23	3 970 44	4 400 00		429 56
24	3 851 33	4 400 00		548 67
25	3 735 79	4 400 00		664 21
26	3 623 72	4 400 00		776 28

It will be seen that, on the basis assumed, the income would be less than from the present system for more than 19 years; after that it would become greater.

The capitalization of the fund at 5 per cent. has been assumed, because it would not probably be possible to obtain more than that on the par value of the fund. No expenses for Trusteeship, &c., have been assumed.

If the above considerations are fairly correct, it would seem to follow:—

1. That the proposed measure of compounding at $150 and $300 would decrease the current income to an extent we cannot now afford.

2. That if desirable to compound dues, and at the same time not reduce the current income, higher rates must be assumed for compounding.

3. That if the present funds of the Society were anything like those of the English Institution, a measure of this kind might well be adopted, as we could then afford a present loss of income for an ultimate increase.

NOTE.—The invested funds of the English Institution are:

Institution investments	£31,000
Trust funds	45,700
Total	£76,700
Or, say	$383,500
The annual income of the English Institution is about	£14,200
Or, say	$71,000

Very respectfully,

JOHN BOGART,
Secretary.

An examination of the statements presented by Mr. Bogart shows that if the compounding of dues at the rate of $300 for resident members and $150 for non-resident members was adopted and generally followed, the effect upon our revenues would be disastrous, as it would cut off our entire revenue from this source the first year, and diminish it nearly 50 per cent. the second year; not reaching its full amount until 19 years hence.

It is not probable that the practice of compounding dues would be

immediately and generally followed. But if this plan should meet with favor, and any considerable number of members should compound their dues, there would be as large a percentage of falling off of proceeds from dues as there would be percentage of members compounding, as all such members would cease to pay dues, and the interest from the sums paid in would not be available during the first year.

The second year there would be a loss of nearly fifty per cent. of the dues of those who had compounded the year before, and, added thereto, would be a total loss of all the dues of members compounding that year.

And each succeeding year the lessening of the dues would go on until a maximum of decrease would be reached, an uncertain number of years hence, when the revenue would gradually increase again, if the Society survived the experiment.

We further notice that if non-resident members should compound in larger proportionate numbers than resident members, there would be a still greater falling off of income.

The proposed compounding rates being less in proportion for non-residents than residents, as compared with the dues now paid by each, would tend to encourage a disproportionate number of non-residents to compound, and this disproportion would tend to produce the result mentioned.

We would also call attention to the probability that the class of members most likely to compound their dues would be those best able to pay their dues promptly, and who have reasonable prospects of living long enough to make the sum paid for compounding a good investment; and, if through such an experiment as this proposed, or from any other cause the dues should require to be increased, this extra burden would fall upon others, leaving this class exempt.

With these facts before us, and in the present state of our finances, when our expenses so nearly correspond with our income, we cannot recommend any basis for compounding dues which shall tend to lessen our present annual income.

The plan of compounding the dues of members on the basis proposed would tend to seriously lessen our annual income. And the more generally this plan came into practice, the greater would be our financial embarrassment.

The only amounts that, under the present circumstances, would be

safe to adopt would be so large as to appear unreasonable, and tend to discourage members from compounding.

While we look with favor upon the plan of compounding dues as having for its object the permanent and best interests of this Society, and which, if in successful operation, would in time accomplish all that might be expected of it, yet we fear that its introduction at the present time might so seriously embarrass the Society financially as to jeopardize those important interests which this plan was especially designed to subserve.

We therefore recommend that this proposed amendment to the Constitution be not adopted.

Respectfully submitted,

W. H. PAINE,
JOS. P. DAVIS.
C. V. SMITH,
Committee on Finance.

HOUSE OF THE SOCIETY, October 12, 1881.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

		Date of Election.
BLACKWELL, CHARLES	Engineer Midland and Grand Junction Railways, Peterborough, Canada	Sept. 7, 1881
ENGLE, ROBERT L.	Engineer Rio Grande Ex. Co., Gunnison, Col.	" "
GOAD, CHARLES E.	102 St. Francis Xavier Street, Montreal, Canada	" "
KEITH, GEORGE T.	Civil Engineer, Olean, N. Y.	May 4, 1881
PARENT, E. H.	Superintending Engineer Beauharnois, Lachine and Chambly Canals, Montreal, Canada	Sept. 7, 1881
SKILTON, GEORGE S	Assistant Chief Engineer Mexican Central Railway, City of Mexico, Mexico	" "
THOMAS, JOSEPH R.	Engineer Williamsburg Gas Co., Brooklyn, N. Y.	Oct. 5, 1881
WADDELL, JOHN A. L.	Engineer Raymond and Campbell Bridge Co., Council Bluffs, Ia.	" "

CHANGES AND CORRECTIONS.

MEMBER.

BILLIN, CHARLES E.....Illiana, Edgar Co., Ill.
BLAND, JOHN C.....259 South 4th Street, Philadelphia, Pa.
BONTECOU, D.....P. O. Box L., Kansas City, Mo.
CHITTENDEN, S. H.....Corcoran Building, Room 69, Washington, D. C.
CUNNINGHAM, D. W.....Stillwater, Minn.
CUNNINGHAM, J. H.....50 Queen Street, Edinburgh, Scotland.
DOANE, WALTER A.....Principal Assistant Engineer Rome, Watertown and Ogdensburgh R. R., Oswego, N. Y.
FRAZIER, JAMES L.....Louisville, New Albany and St. Louis R. R., Louisville, Ky.
FULLER, SIDNEY T.....Chief Engineer Texas Mexican R. R., Galveston, Texas.
JOHN, IRVIN.....20 Nassau Street, Room 57, New York City, N. Y.
KINSLEY, THOMAS P.....Le Roy, Genesee Co., N. Y.
MACNAUGHTON, JAMES...Assistant Engineer North River Construction Co., Albany, N. Y.
MONROE, J. ALBERT.....Div. Engineer N. Y., W. S. & B. R. R., Rondout, N. Y.
NEWMAN, ROBERT M.....Engineer Jamestown Branch, Jamestown, Dakota.
ROBINSON, A. A.. .....Chief Engineer A. T. & S. F. R. R., Topeka, Kansas.
SCOWDEN, T. R.....1220 Lexington Avenue, Cleveland, Ohio.
SEARS, ALFRED F.....Assistant General Manager Mexican Central R. R., City of Mexico, Mexico.
SHINN, WILLIAM P.....Vice-President N. Y. Steam Co., 16 Cortlandt Street, New York City, N. Y.
SICKELS, T. E.....Consulting Engineer Union Pacific R. R., 197 Broadway, New York City, N. Y.
SMITH, ISAAC W.....Chief Engineer Oregon Pacific R. R., Corvallis, Oregon.
STAUFFER, D. MCN.....Philadelphia Bridge Works, 259 South 4th Street, Philadelphia, Pa.
STEPHENS, CLINTON F....Chief Engineer Texas and St. Louis R. R., Waco, Texas.
SWAN, CHARLES H.....25 Wabon Street, Boston Highlands, Boston, Mass.
SWEET, CHARLES A.....Assistant Engineer Mexican Central R. R., Leon, Mexico.
SWEET, E., JR.....16 Exchange Place, New York City, N. Y.
VAN BUREN, JOHN D., JR..Newburgh, N. Y.
VAUGHAN, F. W.....Consulting Engineer, Henderson Bridge Co., Louisville, Ky.
WAITE, C. C..... ....Assistant to President N. Y., L. E. and W. R. R., 21 Cortlandt Street, New York City, N. Y.
WALKER, JOHN S.....Huntsville, Ala.
WELLINGTON, ARTHUR M..Principal Assistant Engineer Mexican National R. R., Cadena No. 11, City of Mexico, Mexico.

JUNIORS.

ALLEN, JAMES P.....6 Glebe Street, Charleston, S. C.
EMONTS, W. A. G.....Langhorne, Bucks Co., Pa.

HORTON, SANDFORD.....Assistant Engineer Tehuantepec I. O. R. R., Jaltipan, Mexico.

STAHLBERG, A. J.....O. and C. R. R., Roseburg, Oregon.

ASSOCIATE.

WHEATON, EDWARD.....Care Wm. Frazier & Co., 64 Equitable Building, Boston, Mass.

DEATH.

CARTWRIGHT, HENRY.....Elected Member September 6, 1876. Died July 30, 1881

American Society of Civil Engineers.

PROCEEDINGS.

Vol. VII.—November, 1881.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

OCTOBER 19TH, 1881.—The Society met at 8 P. M., Past President E. S. Chesbrough in the chair.

The paper upon Experiments on Phœnix Columns, by Messrs. T. C. Clarke, John Griffen, A. Bonzano and David Reeves (Clarke, Reeves & Co.), which had been presented at the Convention at Montreal, June 18th, 1881, was discussed by Messrs. Charles E. Emery, D. V. Wood, Theodore Cooper, Thomas C. Clarke, and, through the Secretary, by G. Bouscaren.

NOVEMBER 2D, 1881.—The Society met at 8 P. M., Vice-President Welch in the chair.

A communication was presented from the Engineers' Club of Rio de Janeiro, Brazil, expressing sympathy for the death of Past President W. Milnor Roberts. Accompanying the communication was an album of photographs of the Dom Pedro Segundo Railway, the last road

traveled by Col. Roberts. The following named members were appointed a Committee to prepare an answer to the communication: Past President E. S. Chesbrough, Vice-President Ashbel Welch, and Secretary John Bogart.

Discussions upon the paper by Messrs. Clarke, Reeves & Co., subject, Experiments on Phœnix Columns, were presented, through the Secretary, from Messrs. William H. Burr, Theodore Cooper, C. L. Gates, Mansfield Merriman, C. L. Strobel, D. J. Whittemore and A. S. C. Wurtele.

NOVEMBER 16TH, 1881.—The Society met at 8 P. M., Charles Macdonald in the chair.

The death of Henry Cartwright, Member of the Society, was announced and the appointment of a Committee authorized to prepare a memoir for publication.

The subjects discussed were: Protection against Slips in Clay Slopes by burning the clay in position at the foot of the slopes; also the Lateral Thrust of Earthwork; also apparatus for Supplying Steam, Heat and Power to Districts in Cities.

OF THE BOARD OF DIRECTION.

OCTOBER 4TH, 1881. — The Board determined to recommend the adoption of amendment to Article XXIII of the Constitution and to Section 24 of the By-Laws, as printed in Proceedings for October, 1881. The following resolution was adopted: that whereas, the beginning of the Society fiscal year has been changed from the first Wednesday in November to the first day of January, there will be due on November 2d, for the two months, November and December, 1881, two-twelfths of the regular annual dues, and the Secretary is directed to forthwith issue bills for these two months, with this explanatory note.

The censors for awarding the Norman medal were, under the rule, designated, namely, Messrs. Thomas C. Keefer, T. E. Sickels and Henry Flad.

The Secretary was instructed to prepare and issue a circular soliciting additional subscriptions to the Building Fund. The Secretary was instructed also to issue a circular soliciting additional contributions to the Library.

OCTOBER 12TH, 1881.—Applications were considered. The Committee on Finance made a report on the subject of Compounding Dues of Members by one payment for life.

NOVEMBER 2D, 1881.—Financial business was transacted and the investment of a portion of the Fellowship Fund in United States Bonds was ordered. The report of the Finance Committee on Compounding Dues was ordered printed. Appropriations were made.

THE NORMAN MEDAL.

CODE OF RULES FOR ITS AWARD.

I.—Competition for the Norman Medal of the American Society of Civil Engineers shall be restricted to Members of the Society.

II.—There shall be one gold medal, and only one, struck for each and every fiscal year of the Society, and awarded as hereinafter provided. The dies therefor shall be with the Superintendent of the United States Mint at Philadelphia, in trust exclusively for the above purpose. Such Medal shall be of a cost equal to the annual interest received upon $1 000 of the Consolidated Stock of the City of New York, Certificate No. 179, of the additional new Croton Aqueduct Stock of the City of New York, authorized by an Act of the Legislature of the State of New York, Chap. 230, passed April 15th, 1870, dated November 17th, 1873, now held in trust by the Treasurer of this Society, and so held solely for this purpose, and shall be executed upon his order.

III.—All original papers presented to the Society by members of any class, during the year for which the medal is awarded, shall be open to the awards, provided that such papers shall not have been previously contributed in whole or in part to any other association, nor have appeared in print prior to their publication by the Society, nor have been presented to the Society in any previous year.

IV.—The Board of Censors to award the Medal shall consist of three members of the Society, to be designated by the Board of Direction. The Secretary of the Society shall act as Secretary to the Board of Censors.

V.—The medal shall be awarded to such paper as the said Board shall judge to be worthy of special commendation for its merits as a contribution to Engineering Science, not merely relatively as compared with others presented during the same year, but as exhibiting the science, talent or industry displayed in the consideration of the subject treated of, and for the good which may be expected to result from the discussion and the inquiry.

VI.—In case no paper presented during the year shall be deemed of sufficient value to receive an award, the amount of the interest of the fund for that year shall be expended by the Board of Direction in the purchase of books, to be offered as a premium for the second best paper in the next year in which more than one paper of sufficient value may be presented.

VII.—The medal year shall terminate on the first day of August, and the award shall be announced at the Annual Meeting.

VIII.—The Treasurer of this Society shall cause the medal to be prepared and delivered to, or deposited to the order of, the successful competitor, within two months after the Annual Meeting at which the same shall have been awarded.

ADDITIONS TO

LIBRARY AND MUSEUM.

From Prof. R. H. Thurston, Hoboken, N. J.:

Proceedings of the Fifteenth Annual Meeting and List of Members of the New England Cotton Manufacturers Association. Boston. 1880.

Contract and Specifications for Road and Pipe Trench of the Fall River Water Works.

Improvement in Metals for Car Wheels. Hamilton Steel Wheel Co. Philadelphia.

Constitution and By-Laws of the New York Society of Practical Engineers. New York. 1870.

Report of E. L. Viele, Chief Engineer of the Arcade Under Ground Railway. New York.

Report of Observations on Railways made in 1874 and 1875. By Direction of the Government of Victoria. Melbourne. 1876.

A Practical Description of Herron's Patent Trellis Railway Structure. James Herron. Philadelphia. 1841.

A Description of Improvement in the Construction of Bridges. Ithiel Town. New York. 1839.

The Reading Railroad: Its Advantages for Cheap Transportation of Coal. Philadelphia. 1839.

Iron Piers for Deep Water. S. R. Dickson, C. E. New Haven. 1872.

Description of Sandberg's Standard Rail Sections.

Contract for Rails and Fastenings. Sandberg's Form of Specification.

Light Railways in Sweden. C. P. Sandberg. C. E. 1870.

Railways in Sweden: Their cost, gauge and speed. C. P. Sandberg. 1873.

Annual Report of the Hartford Steam Boiler Inspection and Insurance Co. Hartford. 1873, 1875, 1877, and 1878.

Civil Engineers Club of the North West. Deep Pile Driving in Wisconsin. C. W. Durham. 1875.

Leveeing on the Mississippi River. E. L. Corthell. 1874.

Improvement of the Mouth of the Mississippi River. James B. Eads. 1874.

Improvement in Electric Railway Signals, J. M. Goodwin. Cleveland. 1873.

An Act to Incorporate the New Jersey Railroad and Transportation Co. Newark. 1832.

Report on the Mississippi Jetties. Capt. J. B. Eads, 1876.

Annual Report of the Department of Docks of the City of New York. 1878.

Annual Report of the Chief Engineer of the Board of Public Works of Jersey City, N. J. 1877.

Progress of the Physical Department of the Mass. Institute of Technology, from 1867 to 1877. E. C Pickering. Boston. 1877.

Annual Catalogue with Minutes of the Ninth Annual Meeting of the Stockholders of the Swarthmore College. Swarthmore. Pa. 1873.

Letter of Sir Charles A. Hartley, on Jetties at the Passes of the Mississippi. Washington, D. C. 1875.

Report of Hearing before the Commissioners on Apportionment between Boston and Cambridge, of the Expense of Maintaining the West Boston and Canal Bridges. Cambridge. 1870.

Survey of Harbor and Mouth of Connecticut River. 1838.

The Jurisprudence of Surveys; A Paper read before the Civil Engineers Club of the North West. S. S. Greeley. 1873.

The Importance of Boulevards as a Means of Checking Conflagrations. H. S. Cleveland. 1874.

Mouth of the Mississippi. Canal and Jetties Compared.

Fifth and Sixth Report upon Improvement of the South Pass. Gen. C. B. Comstock.

Fourth, Fifth, Seventh, Eighth Annual Reports of the Board of Railroad Commissioners of Massachusetts.

Second Report of the New York and Erie Railroad Company. New York. 1841.

Bridging the Hudson at Poughkeepsie.

First Report of the Superintendent of Water Works of Newport, Ky. Newport. 1874.

Letter of the Mississippi Bar Pilots on Fort St. Phillips and South West Pass. Pilot Town, La. 1874.

Official Report on the Apparatus for Burning Liquid Fuel in Marine and Locomotive Boilers. A. C. Stiners. Boston. 1868.

A Protest from Gen. C. K. Graham against the needless expenditures of public money for the alleged necessary strengthening of the "Béton en Masse" Walls on the North River Front. New York. 1876.

Report of the Commissioners named by the Legislature of New Jersey Incorporating the Somerville and Easton Railroad. Elizabethtown. 1847.

Proposals for Cast Iron Water Pipes and Special Castings for the Fall River Water Works.

Contract and Specifications for Streets and Roads of the City of Fall River.

Contract and Specifications for Trenching and Back-filling for Water Pipes for the Fall River Water Works.

Annual Report of the Denver and Rio Grande Railway. Philadelphia. 1873.

Improvement of the Mississippi River at or near the Falls of St. Anthony. Gen. G. K. Warren.

An Account of some of the Bridges over the Charles River. Cambridge. 1858.

Annual Reports of the Lake Shore and Michigan Southern Railway Co. Cleveland. 1874 and 1877.

Memoir of the Delaware and Raritan Canal and Camden and Amboy Railroad. 1834.

Survey of Sandusky Harbor. 1838.

Annual Report of the Louisville and Nashville Railroad. Louisville, 1875.

Annual Report of the American Railway Master Mechanics Association. Cincinnati. 1876.

A Memorial on Behalf of the Removal of Muscle Shoals Obstruction of the Tennessee River. Chattancoga. 1878.

Annual Report of the Boston Water Works. Boston. 1879.
An Address on the Railways and Telegraphs of the Nineteenth Century. S. B. Ruggles. New York. 1866.
A Statement of the Relations of Railroads to the Public. F. B. Thurber. New York. 1878.
A New Lantern Galvanometer. A. M. Nayer.
Survey of the Harbor of Lynn, Massachusetts. 1838.
Annual Report upon the Surveys of Northern and North Western Lakes. Gen. C. B. Comstock. Washington. 1880.
Annual Reports of the Board of Water Commissioners of Manchester, N. H. Manchester. 1873 and 1875.
Description of a Hydraulic Pontoon Dock, invented by J. W. Nystrom. St. Petersburg. 1859.
Annual Reports of the Lowell Water Board. Lowell, Mass. 1873 and 1878.
A System of National Defense and Establishing National Foundries. 1840.
Report of the City Engineer of Providence for 1874.
Description of Iron Suspension Bridges at Bangor, Conway, &c., &c. London. 1824.
Bulletin of the Proceedings of the National Institution for Promotion of Science. Washington. 1841.
Communication to the Board of Aldermen of New York by the President of the Trustees of the New York and Brooklyn Bridge. Brooklyn. 1876.
Engineers' Report of the New York City Central Underground Railway. New York. 1869.
Henry's Patent Improved Method of Riveting Boiler Plates.
Survey of the Alleghany River. 1838.
Annual Report of the Chief of Engineer's U. S. A. for 1870.
On Economy of Fuel and the Consumption of Smoke. S. Kneeland. Boston. 1867.
Cases Relating to Telegraphs and Telegrams in American, Canadian and English Courts. Rochester, N. Y. 1866.
Survey of Newark Bay. 1839.
Report of the Chief Engineer of the Charlestown Water Works. Boston. 1865.
Report of the Water Commissioners of Peekskill, N. Y. 1877.
Physics and Hydraulics of the Mississippi River. James B. Eads. New Orleans, La. 1876.
Memoir of the St. Joseph Bridge. Detroit, Mich.
Specifications for an Office Building for the Northern Central Railway Company. Jos. M. Wilson. Philadelphia. 1875.
Ship Building in America. John Roach.
Report on Tests of Eight Oils. J. H. Coleman. Hoboken, N. J. 1877.
Report of the Corporators of the Boston, Hoosac Tunnel and Western Rai road. Boston. 1875.
Civil Engineering, Public Works, and Architecture. Wm Watson. Washington. 1875.
Tabulated Results compiled from Annual Reports of Railroad, Passenger, Canal and Telegraph Companies of Pennsylvania. Harrisburg. 1875, 1876.
A Short Treatise on the Designing and Construction of Geering and Mill Work. New York. 1873.
Annual Report of the Lake Shore and Michigan Southern Railroad. Cleveland. 1873.
Preliminary Report of the Honduras Inter-Oceanic Railway. E. G. Squier. New York. 1854.
Address of Mr. J. B. Eads before the Congressional Committee on Inter-Oceanic Canals in Reply to Count De Lesseps. 1880.
Address before the American Association for the Advancement of Science. A. Hall. Cambridge. 1880.
Correspondence between the business Men of New Orleans and James B. Eads.
Officers, Members and Rules of the American Institute of Mining Engineers.
Safe and Rapid Mode of Tunneling the Hudson. O. B. Dowd. New York.
Argument of Wm. Orton on the Postal Telegraph Bill. New York. 1874.
Annual Report of the Silk Association of America. New York. 1875.
Proposed Union of the Telegraph and Postal Systems. Cambridge. 1869.
Report of the Alabama and Chattanooga Railroad. T. G. Smith. Troy. 1871.
Report of the Committee on Foreign Affairs. Washington. 1876.
Survey of the Harbor of New Haven, 1839.
An Improved System of Cornish Pit Work. E. Daggett. 1879.
Prospectus of the American Steam Boiler and Accident Insurance Company. New York. 1866.
Annual Report upon the Improvement of the Mouth of the Mississippi. Capt. C. W. Howell. Washington. 1873.
Report on the Mississippi Jetties. J. B. Eads. New York. 1876.
Review of the Report of the Mississippi Jetties. J. B. Eads. 1878.
Report on the Grigg's Spark Arrester and Consumer. A. Firth. Pawtucket. 1875.
Argument of the National Association of Bar Iron Manufacturers against any Reduction of Present Duties on Iron. Philadelphia. 1872.
The Panama Ship Canal and Inter-Oceanic Ship Railway Projects. J. M. Goodwin. Cleveland. 1880.
Preliminary Report of the Committee on the Judiciary of the Senate of Pennsylvania on the Difficulties in the Coal Regions.
Report on the Metallurgy of Lead, Silver Copper and Zinc. H. Painter. Washington. 1875.
An Analysis of the Steel Cable Wire of the East River Suspension Bridge. A. Hill. New York. 1877.
Sewerage and Sewage of the City of New York. C. H. Haswell. New York. 1877.
An Analysis of the Corporation of the City of New York. New York. 1854.
A Review of recent Telegraphic Legislation in Canada. London. 1875.
A Discourse on the Atlantic Telegraph. Rev. Dr. Copp. Boston. 1868.
A Letter to the Postmaster-General Reviewing the Recommendations of his Annual Report in favor of a Postal Telegraph.
A Practical and Reliable Apparatus for Removing Scale in Boilers and Preventing its Formation. Philadelphia. 1866.
Report on the Iron Smelting Coals of Southern Indiana. J. W. Foster. Pittsburg. 1871.
Report of the Inspection of the South Pass Improvement. Gen. C. B. Comstock. Washington. 1876.
Annual Report of the Lake Shore and Michigan Southern Railroad Company. Cleveland. 1875, 1876 and 1878.

Annual Report upon the Improvement of the Tennessee Rivers. W. R. King. Washington. 1878.
Speech on Harbor Defenses. Hon. R. F. Stockton. Washington. 1852.
Report of the Chief Engineer of the Kansas City Water-Works. Kansas City. 1875.
Proceedings of the Convention of the American Pig Iron Manufacturers' Association. Philadelphia. 1872.
Review of the Case of the Free Bridge between Boston and Charlestown. Boston. 1827.
Statutes of New York and Canada in Relation to the Bridge across the Niagara River. Buffalo. 1858.
An Answer to a Pamphlet entitled "Considerations on the Public Expediency of a Bridge from one Part of Boston to the Other." Boston. 1806.
Report of Proceedings of the Board of State House Commissioners. Indianapolis, Ind.
Report on Blasting Operations at Lime Point, California. Col. G. H. Mendell. Washington. 1868.
A Synopsis of the Patent Laws of Various Countries. A. Tolhausen. London. 1868.
Argument of Franklin B. Gowen, Esq., before the Joint Committee of the Legislature of Pennsylvania. Philadelphia. 1875.
Annual Report of the City Engineer of Boston. Boston. 1881.
Annual Report of the Columbia Oil Company. Pittsburg. 1881.
Appendix to the History of the Atlantic Telegraph. H. M. Field. New York. 1867.
Ships' Compasses, Including the Subjects of Binnacles and Swinging Ship. Washington. 1869.
Preliminary Report upon the Iron and Steel Industries of the United States. J. M. Swank. Philadelphia. 1881.
The Relation of the Government to the Telegraph. D. A. Wells. New York. 1873.
Report of the Investigating Committee of the Pennsylvania Railroad Company. Philadelphia. 1874.
Surveys of the Harbors of New Buffalo and Twenty-Mile Creek. 1838.
Argument by Henry W. Muzzey before the Legislative Committee on Harbors. Cambridge. 1879.
Report of the Northern Railway and Coal Company. New York. 1865.
Report on the Ashcroft Furnace-Doors and Grate-Bars. Washington. 1878.
Argument before the U. S. Commissioners at the Charletown Navy Yard. W. W. Wieldon. Charlestown. 1869.
Pittsburg and Alleghany in the Centennial Year. G. H. Thurston. Pittsburg. 1876.
Report on the Military and Naval Defenses of the United States. 1840.
The Great National Highway between the Missouri River and California. Chicago. 1863.
Report of the National Association of Bar Iron Manufacturers. Philadelphia. 1872.
Annual Report of the Chief Engineer of the St. Joseph Bridge. 1872.
Notes on Public Works in the United States. Sir Charles Hartley.
Prospectus of the Valley Railroad Company. Cleveland. 1874.
Report of the Chief Engineer on the Unfinished Portion of the Northern Pacific Railroad. New York. 1874.
Report of the Chief Engineer of the Camden Water Works. Camden, N. J. 1873.
Report of the Engineer of the Illinois and St. Louis Bridge. St. Louis. 1871.
Annual Report of the Department of Public Works of Chicago. Chicago. 1873.
Additional Chapters, with Appendix, to the Second Edition of the Atlantic Telegraph. H. M. Field. New York. 1867.
Proceedings of the American Pig Iron Manufacturers' Association. Philadelphia. 1873.
Plates of Keeper's Dwelling for a First Order Light House.
Plates of First Order Light House on Fowey Rocks, Fla.
Plates of Light Keeper's Dwelling.
Plates of Light House for Fort Ripley Shoal, Charleston Harbor, S. C.
Plates of Screw Pile Light Houses for Thomas Point Shoal and Port Tobacco Flats.

LIST OF MEMBERS.

ADDITIONS.

MEMBER.

		Date of Election.
BRITTAIN, ALFRED.	City Surveyor's Office, Montreal, Canada...	Nov. 2, 1881.

CHANGES AND CORRECTIONS.

MEMBERS.

ALDRICH, JAMES C.....63 Clark St., Brooklyn, N. Y.
ALDRICH, T. H.....P. O. Box 321, Birmingham, Ala.
BARNARD, A. P .....Care D. Van Nostrand, 23 Murray St., New York City, N. Y.
BRUNER, D. P.....Res. Engineer Pittsburgh and Western R. R., Allegheny, Pa.
DEMPSTER, A.....Stanton and Euclid Aves., Pittsburgh, Pa.
EVANS, WALTON W.....New Rochelle, N. Y.
GOLAY, P..... ..New Orleans and North Eastern R. R., New Orleans, La.
GREENE, DAVID M.....41 First Street, Troy, N. Y.
HARRIS, WILLIAM P.....Supt. Western Div. Chesapeake and Ohio R. R., Huntington, W. Va.
HOUSTON, JOHN.....Chief Engineer La Guira and Caracas and Portocabello and Valencia R. R's, La Guira, Venezuela.
LATROBE, CHARLES H ....10 South St., Baltimore, Md.
LINVILLE, J. H.....Consulting Engineer, 4117 Walnut St., Philadelphia, Pa.
MCKEOWN, THOMAS.....Chief Engineer Marquette and Mackinaw R. R., Marquette, Mich.
MCLAIN, LOUIS R.....Div. Engineer R. & D. Extension Co., Oxford, Ala.
NEILSON, ROBERT.....Gen. Sup't P. & E. Div. P. R. R. and Susquehanna, Shamokin and E. and C. Div's Northern Central Ry., Williamsport, Pa.
OLNEY, L. F..... .....Middletown, N. Y.
POST, JAMES C.....Capt. of Engineers U. S. A., Charleston, S. C.
SEDGWICK, THOMAS S.....Land Agent A. and P. R. R., New Albuquerque, N. M.
SEYMOUR, CHARLES.....Res. Engineer New York, Chicago and St. Louis R. R., Vermillion, Ohio.

SIMPSON, GEORGE H. .....New York, Lackawanna and Western R. R., Dansville, N. Y.
WROTNOWSKI, A. F. .....Engineer Harbor Improvements, Vera Cruz, Mexico.

JUNIORS.

ABBOTT, ARTHUR V .....9 Middagh St., Brooklyn, N. Y.
GILLESPIE, J. L. .....Ass't U. S. Engineer, P. O. Box 2127, St. Paul, Minn.
RAYMOND, CHAS. WARD...New York Works Hudson Tunnel Construction Co., foot of Morton St., New York City, N. Y.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. VII.—December, 1881.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

DECEMBER 7TH, 1881.—The Society met at 8 P. M., Vice-President Welch in the chair. The appointment was directed of a Committee to make arrangements for the Annual Meeting to take place January 18th, 1882. A discussion by E. Yardley, Member A. S. C. E., upon Quicksand in Excavation, was read by the Secretary, and discussed by members present.

DECEMBER 21ST, 1881.—The Society met at 8 P. M., Vice-President Welch in the chair. A vote upon the recent Railroad Crossing case at Elmira, N. Y., with reference to the hydraulic questions brought forward was read by William R. Hutton, Member A. S. C. E. and discussed by Messrs. Adams, J. P. Davis, Emery, Macdonald, Welch and Worthen.

OF THE BOARD OF DIRECTION.

DECEMBER 7TH, 1881.—Applications were considered. Arrangements for the approaching Annual Meeting were considered.

CONTRIBUTIONS TO THE BUILDING FUND.

By a resolution of the Board of Direction, all contributions to the Building Fund are to be acknowledged, from time to time, by printing lists of the same in the monthly Proceedings of the Society, and in addition to this the names of all those who may subscribe $100 or more are to be regularly enrolled and published in future lists of the Society under the head of Subscribers to the Building Fund, and they will be entitled to receive one copy of the monthly publications, comprising all papers and transactions of the Society, regularly, for life, for each $100 subscribed by them; such copies to be in addition to those which they may be already entitled to if they are Members or Fellows.

The following contributions are acknowledged in addition to those heretofore noted:

Francis J. Cisneros	$500 00
*E. L. Corthell	50 00
Eckley B. Coxe	200 00
James H. Cunningham	100 00
*J. B. Eads	125 00
*Henrique Harris	50 00
†B. D. Hasell	100 00
†J. R. Maxwell	100 00
Prescott, Scott & Co	100 00
E. Prince	20 00
T. E. Sickels	100 00
F. C. Weir	50 00

*In addition to the same amount previously acknowledged.
†Additional subscription to payment previously acknowledged.

MEMOIRS OF DECEASED MEMBERS.

ANDREW KLOMAN, Fellow A. S. C. E.

DIED DECEMBER 19TH, 1880.

Andrew Kloman, was born at Treve, Prussia, August 25th, 1827. He was educated in the Free Schools of Germany, but was at an early age engaged at the large Iron Works at Marion-Hûtte, with his father who was the Superintendent of rolls at those Works. His parents both died be-

NOTE.—Committee to prepare memoir, Charles Macdonald, William Metcalf, John Bogart. The principal facts of interest in the life of Mr. Kloman, as given in this memoir, were obtained from the Iron Age of New York, to which journal the Committee desires to express its acknowledgements.

fore he reached the age of eighteen and he then came to America, landing in New Orleans in December, 1845. He went to Pittsburg in the Spring of 1846, and obtained employment, first in the Novelty Works and afterwards in the Steel Works of Singer, Hartman & Co., where he was entrusted with the responsible duty of finishing and testing steel for wagon springs. In 1853 he went into business in a modest way, erecting a forge, and himself doing the work with the assistance of his elder brother. He gradually developed this into the extensive works afterwards so well know. In particular his peculiar genius showed itself in his abandonment of old methods and his invention of new machinery to meet the requirements of his business.

At a time of growing demand for axles he invented a new method for making the pile from which they were hammered, which consisted of a bundle 1 inch square bars bound closely together with the direction of the fibers alternately reversed. This Kloman axle was very successful.

Mr. Kloman afterwards, in conjunction with Mr. Henry Thipps, built the large mill in Pittsburg, now owned by Wilson, Walker & Co. He here made many improvements in designs for rolled shapes, and in machinery for making them. In 1864 this mill was consolidated with the Cyclops Mill and a stock company was formed under the name of the Union Iron Mills ; Messrs. Andrew and Thomas N. Carnegie, being largely interested. Here Mr. Kloman invented many new devices and machinery, among which were the cold saw and a straightening machine which involved a new mechanical motion. This consisted in shortening and lengthening at will the stroke of a piston driven by a cam movement. Mr. Kloman, although the first to apply the cold saw for cutting iron, did not claim and patent its invention because he stated that he took the idea from seeing European watch-makers cutting small spur wheels out of brass disks by bearing them against rapidly revolving steel disks of the size of a penny.

During the construction of the St. Louis Bridge a reliable coupling was required for the tubes forming arches. It was determined to try wrought-iron but the shape being larger than anything before attempted in this country, it was doubted whether any American mill could produce it. Mr. Kloman, however, agreed to make it and in a short time the rolls were prepared, and the largest rolled shape ever made in this country was successfully produced. Its width in the rolls was about 30 inches.

Mr. Kloman was particularly interested in the manufacture of special shapes and was very successful in this direction. Large additions to the works of the firm were made in 1871. In this year also the Lucy Furnace No. 1, was built under his immediate supervision and it was probably, when finished, the most complete blast furnace built up to that time. He introduced the new feature of regulating the inflow of the blast by the revolutions of the blowing engine, discarding the indications of the pressure gauge, which method is now generally adopted. He also in-

vented a rotary table with cooling boxes for receiving slag from the furnaces and conveying it in convenient form to a proper deposit. He successfully introduced into the Union Iron Mills the universal method for rolling heavy and long bridge plates and he devised an ingenious clutch for reversing the motion of the mill. In 1872, Mr. Kloman, in connection with a number of others, purchased land in the Lake Superior region and built a large charcoal furnace. Although at first successful, this enterprise resulted disastrously, and in 1874, Mr. Kloman was obliged to sell out all his business interests. Although compelled to start financially anew, he did so with no less reputation, but with the commendation of all those who were acquainted with his course in this matter.

Soon after he devised a system for rolling weldless eye bars. The demand for steel bars made by this process became large, and in the year 1878 he leased the Superior Mill in Allegheny City, where he made the tension members for the Glasgow Bridge, the steel work for the new suspended structure of the Niagara River Suspension Bridge, and the steel for the Plattsmouth Bridge.

In 1879 he projected the erection of a mill where he could manufacture steel structural material in a more satisfactory way. In connection with other manufacturers it was decided to erect a new Bessemer Works, and these were in process of rapid construction. Mr. Kloman, however, had suffered much in health during the whole of the year 1879, and his debility became very serious in the fall of 1880. He was confined to his house for about a month, and died on the 19th of December of that year.

Andrew Kloman's life was a continued example of the potency of manly, vigorous effort and indomitable perseverance. Difficulties which would have seemed insurmountable to most men were to him incentives to renewed activity; and when disaster swept away at one stroke the fruits of years of honest toil, he wasted not one moment in vain regrets for the past but energetically began anew the battle of life; determined to make the best use of the abilities with which he had been endowed. His loss has been deeply felt by the very large number of friends and associates who appreciated his constant kindly advice and intelligent co-operation, and who have long known his genial spirit, indomitable energy and great kindness of heart.

HENRY CARTWRIGHT, Member A. S. C. E.,

DIED JUNE 30TH, 1881.

Henry Cartwright was born September 13th, 1823, at Wilmington, Delaware. He became a Member of the American Society of Civil Engineers, September 6th, 1876.

The parents of Mr. Cartwright removed to Philadelphia when he was quite young, and he served in that city his apprenticeship at a manufactory of steam engines, boilers and general machinery. At the age of twenty-one he became connected with the firm of Battin, Dungan & Co., which was engaged in the construction of gas and water works. This firm, while Mr. Cartwright was associated with it, built gas works at Newark, Paterson, Hartford, New Haven, Rochester, Syracuse and many other places. About the year 1850 they built water works at Buffalo, N. Y., where they adopted a stand pipe to relieve the pumping main, which, it is claimed, was its first application in this country. The pumping engines were of the class known as the Cornish Bull Engine and it is stated were the first Cornish engines used in this country for water works.

In 1854 Mr. Cartwright became associated with Gen. Herman Haupt in the original contract for the construction of the Hoosac Tunnel. He resided for several years at North Adams, Mass., and while there, was for some time a member of the Legislature of that State. On the suspension of work on the tunnel, he returned to Philadelphia and became connected with the American Meter Company of Philadelphia and New York, serving as its Vice-President from 1868 to 1875. He then resigned and became interested in the Penn. Gas Coal Company of Philadelphia, which has large mines in Westmoreland County, Pennsylvania. He was successively Director and Treasurer of this Company and was elected its President in the spring of the year, 1881. In June of that year, in the prosecution of his duties as President, and in company with other of its officers he was engaged in an inspection of the mines and properties in its control, and during this tour of inspection he passed, on June 30th, 1881, over the Bells Gap Railroad. The party was pushed up the mountain upon a hand-car. In returning they descended by gravity and had passed over about half the road when the car, while moving rapidly, met with an obstruction left on the track by the employees of a saw mill; Mr. Cartwright was thrown in front of the car which passed over him, injuring him internally. He did not lose consciousness and was not considered seriously injured, but he gradually failed and at six of the evening of the same day he died.

Mr. Cartwright, at the time of his death, was the Vice-President of the Franklin Institute of Philadelphia, of which institution he had been for many years an active and influential member and manager. In his many varied occupations he exhibited remarkable abilities and peculiar tact, particularly in matters connected with mechanics, upon which his judgment was especially valuable; while in his personal relations he had secured the friendship and esteem of a large circle of acquaintances whose sincere regret for his loss is heightened by the circumstances under which his useful life was brought to a close.

THE NORMAN MEDAL.

CODE OF RULES FOR ITS AWARD.

I.—Competition for the Norman Medal of the American Society of Civil Engineers shall be restricted to Members of the Society.

II.—There shall be one gold medal, and only one, struck for each and every fiscal year of the Society, and awarded as hereinafter provided. The dies therefor shall be with the Superintendent of the United States Mint at Philadelphia, in trust exclusively for the above purpose. Such Medal shall be of a cost equal to the annual interest received upon $1 000 of the Consolidated Stock of the City of New York, Certificate No. 179, of the additional new Croton Aqueduct Stock of the City of New York, authorized by an Act of the Legislature of the State of New York, Chap. 230, passed April 15th, 1870, dated November 17th, 1873, now held in trust by the Treasurer of this Society, and so held solely for this purpose, and shall be executed upon his order.

III.—All original papers presented to the Society by members of any class, during the year for which the medal is awarded, shall be open to the awards, provided that such papers shall not have been previously contributed in whole or in part to any other association, nor have appeared in print prior to their publication by the Society, nor have been presented to the Society in any previous year.

IV.—The Board of Censors to award the Medal shall consist of three members of the Society, to be designated by the Board of Direction. The Secretary of the Society shall act as Secretary to the Board of Censors.

V.—The medal shall be awarded to such paper as the said Board shall judge to be worthy of special commendation for its merits as a contribution to Engineering Science, not merely relatively as compared with others presented during the same year, but as exhibiting the science, talent or industry displayed in the consideration of the subject treated of, and for the good which may be expected to result from the discussion and the inquiry.

VI.—In case no paper presented during the year shall be deemed of sufficient value to receive an award, the amount of the interest of the fund for that year shall be expended by the Board of Direction in the purchase of books, to be offered as a premium for the second best paper in the next year in which more than one paper of sufficient value may be presented.

VII.—The medal year shall terminate on the first day of August, and the award shall be announced at the Annual Meeting.

VIII.—The Treasurer of this Society shall cause the medal to be prepared and delivered to, or deposited to the order of, the successful competitor, within two months after the Annual Meeting at which the same shall have been awarded.

ADDITIONS TO

LIBRARY AND MUSEUM.

From Charles A. Allen, Worcester, Mass. :

Report on Rebuilding the Lynde Brook Dam.
A complete history of the Worcester Water Works from 1722 to 1877. Worcester. 1878.
Report of the Committee on Additional Supply of Water for City of Worcester. 1881.
A Report upon the possibility of utilizing the Sewage of City of Worcester. 1873.
A complete set of City Documents, containing reports of Mayor, Chief Engineer, City Treasurer, Committees on Finance, and the Several City Officers of the City of Worcester from 1848 to 1881.

From American Academy of Arts and Sciences, Boston :

Proceedings. New Series. Vol. VIII. Whole Series. Vol. XVI. Part 2. From Feb. 1881 to June, 1881.

From American Institute of Mining Engineers, T. M. Drown, Secretary, Easton, Pa. :

The Carbonic Acid Gas Process at the Kehley Rim Colliery Fire. H. M. Chance.
Burnishing and Ductilizing Steel. Jacob Reese.
Proceedings of the Virginia Meeting. May. 1881.
Ore Dressing and Smelting at Pribram, Bohemia. Ellis Clark, Jr.
Brazos Coal Field. Texas. Chas. A. Ashburner.
The Hydrometallurgy of Copper, and its Separation from the Precious Metals. T. S. Hunt.
The Whitewell Firebrick Hot-Blast Stove, and its recent Improvements. F. W. Gordon.
Coal Washing. S. Stutz.
New Method of Mapping the Anthracite Coal Fields of Pennsylvania. Chas. A. Ashburner.
Investigations on the Ore Knob Copper Process. T. Egleston.
Notes on Gold Mill Construction. A. J. Bowie, Jr.
Chemical Methods for Analyzing Rail-Steel. Magnus Troilius.
Manganese Determination in Steel. W. Kent.
Blast Furnace Hearths and Linings. John Birkinbine.
The Rich Hill Iron Ores. E. P. Dewey.
Notes on the Hard Splint Coal of the Kanawha Valley. S. M. Buck.
An Analysis of the Casualties in the Anthracite Coal Mines, from 1871 to 1880. H. M. Chance.
Relations of the Graphite Deposits of Chester County, Pa., to the Geology of the Rocks containing them. Prof. P. Frazer.
On the Solution of Pig Iron and Steel for the Determination of Phosphorus. T. M. Drown.
A Volumetric Estimation of Manganese in Pig Iron and Steel. F. H. Williams.
Note on Black Band Iron Ore in West Virginia. S. B. Sharpless,
The Electrolytic Determination of Copper and the Formation and Composition of So-called Allotropic Copper. J. B. Mackintosh.
Memoranda on the Analysis of Statistics. A. W. Hale.
Discussion on Steel Rails. C. P. Sandberg.

From American Iron and Steel Association, James M. Swank, Secretary, Philadelphia :

Annual Report, containing Statistics of the American Iron Trade to January 1, 1881, and a Review of the present condition of the Iron Industry in Foreign Countries. James M. Swank, Secretary, 1881.

From Robert Ballard, Rockhampton, Queensland, Australia :

Annual Report of the Commissioner of Queensland Railways for 1881. Brisbane. 1881.

From Robert Briggs, Philadelphia :

The Properties of Air relating to Ventilation and Heating. Robert Briggs, C. E. (*Copies for distribution.*)

From the Bureau of Education, Washington, D. C.:

Circulars of Information of the Bureau of Education. Nos. 4, 5 and 6. 1880.

From J. J. R. Croes, New York:

The Public and District Sewers of Denver. H. C. Lowrie. Denver. 1881.

From the Commissioners of the Second Geological Survey of Pennsylvania, W. A. Ingham, Secretary, Harrisburg :

The Geology of the Oil Regions of Warren, Venango, Clarion and Butler Counties, including Surveys of the Garland and Panama Conglomerates in Warren and Crawford, and in Chautauqua County, New York. John F. Carll. Harrisburg. 1880.
The Geology of McKean County and its connection with that of Cameron, Elk and Forrest. Chas. A. Ashburner. Harrisburg. 1880.
The Geology of Clinton County. Part I.
The Geology of Clinton County. A Special Study of the Carboniferous and Devonian Strata around the West Branch of the Susquehana River. H. Martyn Chance. Harrisburg. 1880.
Description of the Coal Flora of the Carboniferous Formation in Pennsylvania and throughout the United States. Vols. I and II.
Report of Progress in Armstrong County. W. G. Platt. Harrisburg. 1880.

From Allen Cunningham, R. E., London :

Hydraulic Experiments. Capt. Allen Cunningham. Roorkee, India. 1880.
Vol. I. Text.
Vol. II Tables, Part 1. Detailed Tables, Part 2. Abstract Tables.
Vol. III. Plates.

From G. Howard Ellers, Chief Engineer Sewerage Department, Chicago :

Annual Report on the General Sewerage System of Chicago for 1880.

From the Engineers Society of Western Pennsylvania, Pittsburgh :

Annual Reports. January 18, 1881.

Address of the Retiriug President. Wm. Metcalf.

Notes of a Trip through the James River Valley. J. D. Weeks.

Discussion by Reuben Miller, B. F. Jones, Wm. Kent, Jos. D. Weeks, W. F. Zimmerman, S. Wickersham and T. P. Roberts.

Pittsburgh's Sewer System. G. H. Brown.

Discussions by Alex. Dempster, Chas. Davis, Wm. Kent, J. J. R. Croes, T. P. Roberts.

Dam of the Montaubry Reservoir. Lieut. F. A. Mahan.

Danks Puddling Furnace. Samuel Adams.

Discussions on "The Basic Dephosphorizing Process. What it is and what may be expected from it," by James Park, Jacob Reese, Charles Parkin, Wm. Metcalf.

Kloman Eulogy. James Parks, Jr., and James Hemphill, Committee.

From Albert Fink, New York :

Proceedings of the Joint Executive Committee from Dec. 18. 1878, to Dec. 18, 1879.

Proceedings Joint Executive Committee of Railroads for 1880.

The Railroad War. Editorial from *New York Herald*, August 3, 1881.

Competition, Combination or Regulation? Editorial from *New York Times*, August 3, 1881.

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From C. E. Fowler, New Haven, Ct. :

Report of the Special Investigation Committee as to the purchase of the New Haven Water Works. New Haven. 1881. (2 copies.)

From Sir John Hawkshaw, F. R. S., London :

Report of the Committee appointed to consider the question of Wind Pressure on Railway Structures. London. 1881.

From Harrison Bros. & Co., Philadelphia, through Charles Neilson, M. Am. Soc. C. E., New York :

History of the Mexican Railway. Gustavo Baz and E. L. Gallo. Mexico. 1876.

From John Hopkin's University, Baltimore, Md. :

Register of the University. 1880–81.

From Institution of Civil Engineers, James Forrest, Secretary, London :

Minutes of Proceedings, Vol. LXIV. 1880–81.

On the Comparative Endurance of Iron and Mild Steel when exposed to corrosive influences. David Philips.

The Actual Lateral Pressure of Earthwork. Benjamin Baker.

The Tide Gauge, Tidal Harmonic Analyzer and Tide Predicter. Sir William Thomson.

Description of a Bucket Dredger in use at the Hull Docks. Robert Apsland Marillier

From Iron and Steel Institute, London :

Journal of the Institute, No. 1, 1881.

From John A. Judson, Newport, R. I. :

Annual Reports of the Sanitary Protection Association of Newport, R. I., for 1880–81.

From John Kennedy, Montreal, Canada :

Annual Report of the Harbor Commissioners of Montreal for 1880. (2 copies.)

From William B. Knight, Kansas City, Mo. :

Report of the Commissioner on Water Works of the City of Kansas. April 16. 1881.

From C. H. Latrobe, Baltimore, Md. :

A Report upon a Plan of Sewerage for Baltimore City and its probable cost. C. H. Latrobe. Baltimore. 1881.

From Miller, Metcalf & Parkin, Pittsburgh :

The Treatment of Steel. Miller, Metcalf & Parkin. Pittsburgh. 1881.

From Mining Institute of Scotland, James Gilchrist, Secretary, Hamilton, Scotland :

Transactions, General Meeting, June 1881. Vol. III., No. 3. Index to Vols. I. and II.

From Isaac Newton, Chief Engineer Croton Aqueduct, New York :

Annual Report of the Croton Aqueduct for 1852, 1861, 1862 to 1868 inclusive.

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Abstract of Registers of Self-recording Instruments. June, 1881.

From North of England Institute of Mining and Mechanical Engineers, Newcastle-upon-Tyne :

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Neber das Technische Schul und Vereinswesen Frankreichs. Wilhelm von Nördling. Wien. 1881.

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List of Members. April 15, 1881.

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The Past and Future of Buffalo. Henry Martin. Buffalo, 1881.

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The Railway Problem. Address of Mr. Franklin B. Gowen on the Position which the City of Philadelphia should occupy to the Commonwealth of Pennsylvania to its transportation times, and to the Railway problem of the day. June 16, 1881.

From the U. S. Coast and Geodetic Survey, Washington :

Deep Sea Sounding and Dredging. A description and discussion of the methods and appliances used on board of the steamer

Blake, Lieut. Com. Charles D. Sigsber, U. S. N. Washington. 1880.

Astronomical and Meteorological Observations made during the year 1876. Rear Admiral C. H. Davis, U. S. N., Supt. Washington. 1880

From E. B. Van Winkle. New York:

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Proposals for Constructing Sewers and Appurtenances in One Hundred and Forty-sixth street, between Third Avenue and Brook avenue, with branches in Willis avenue between One Hundred and Forty-sixth and One Hundred and Forty-seventh streets, and in Courtland avenue, between Third avenue and One Hundred and Fifty-first street.

Proposals for Estimates for Macadamizing Broadway, in the 24th Ward, and also Building Culverts, Laying Drain Pipe, and Paving Gutters therein, from the road leading to Kingsbridge Station, to a point 300 feet north of the Van Courtland's Lane.

Proposals for Constructing Sewers and Appurtenances in One Hundred and Thirty-ninth street, from Third avenue to the Summit between Alexander and Willis avenues with branches in Alexander avenue between One Hundred and Thirty-ninth and One Hundred and Fortieth streets.

Proposals for Estimates for Constructing a Sewer and Appurtenances in One Hundred and Forty-first street, between Alexander and Willis avenues, with branches in Willis and Alexander avenues, between One Hundred and Forty-first and One Hundred and Fortieth streets.

Proposals for Constructing Sewers and Appurtenances in One Hundred and Forty-fifth and One Hundred and Forty-fourth streets, between Third and Brook avenues, and in One Hunred and Forty-third street, between Alexander and Brook avenues, with branches in Willis avenue, between One Hundred and Forty-sixth and One Hundred and Forty-second streets, and in Alexander avenue between One Hundred and Forty-third and One Hundred and Forty-second streets.

From Elwyn Waller, New York:

Report on Croton Water. Elwyn Waller, Ph. D. New York. 1881. (2 copies.)

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Annals of the Dudley Observatory. Vol. II. Albany. 1871.

A Description of the Canals and Railroads of the United States. H. S. Tanner, New York. 1840.

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A Statement of the Property, Condition and Resources of the Reciprocity Mining Company. New York. 1874.

Charter of the Cherry Valley and Mohawk River Railroad. Albany. 1864.

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Report of the Chief Engineer of the Placerville and Sacramento Valley Railroad of California. San Francisco. 1863.

Report on Tidal Investigations in Mystic River and Pond. Boston. 1861.

Proceedings of the Railroad Convention held at the St. Nicholas Hotel in New York. New York. 1855.

Minutes of the Grand International Division of the Brotherhood of Locomotive Engineers, at their Annual Session held at Boston, Mass. Rochester, N. Y. 1866.

Report of the Utica and Schenectady, Syracuse and Utica, Auburn and Syracuse, Auburn and Rochester, Tonawanda and Buffalo, and the Utica Railroad Companies. Nov. 15, 1842.

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The Pacific Railway and the Claims of Saint John, N. B., to be the Atlantic Terminus. Read before the Mechanics' Institute of Saint John, February 7, 1859. T. T. Smith, C. E.

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Specifications for the Excavation, Masonry, Crib Work, Bridging and Fencing, for the Tail Race of the Montreal Water Works.

The Water Supply and the Hydraulic Company Question. Montreal. 1868.

Rapport Annuel du Surintendant de L'Aqueduc de Montreal. Montreal, 1863 and 1864.

Annual Report of the Superintendent of the Montreal Water Works for the year ending January, 1864, 1866, 1868, 1869, 1870, 1871, 1872, 1873, 1874.

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Report of the Montreal Water Works. Wm. J. McAlpine. Montreal. 1869.

Report of the Montreal Water Works. By Walter Shanly, T. C. Keefer and James B. Francis. Reviewed by Wm. Rodden, Alderman. Montreal. 1869.

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Report of the Minority of the Select Committee on the Pro Rata Freight Bill. Albany. 1860.

Remarks of Thomas M. Monroe before the National Board of Trade, at its meeting in December, 1868, in the City of Cincinnati.

An Act to Authorize the Construction of Certain Bridges, and to Establish them as Post Roads.

Address to the American Association for the Advancement of Science. Thomas Sterry Hunt. Salem. 1871.

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